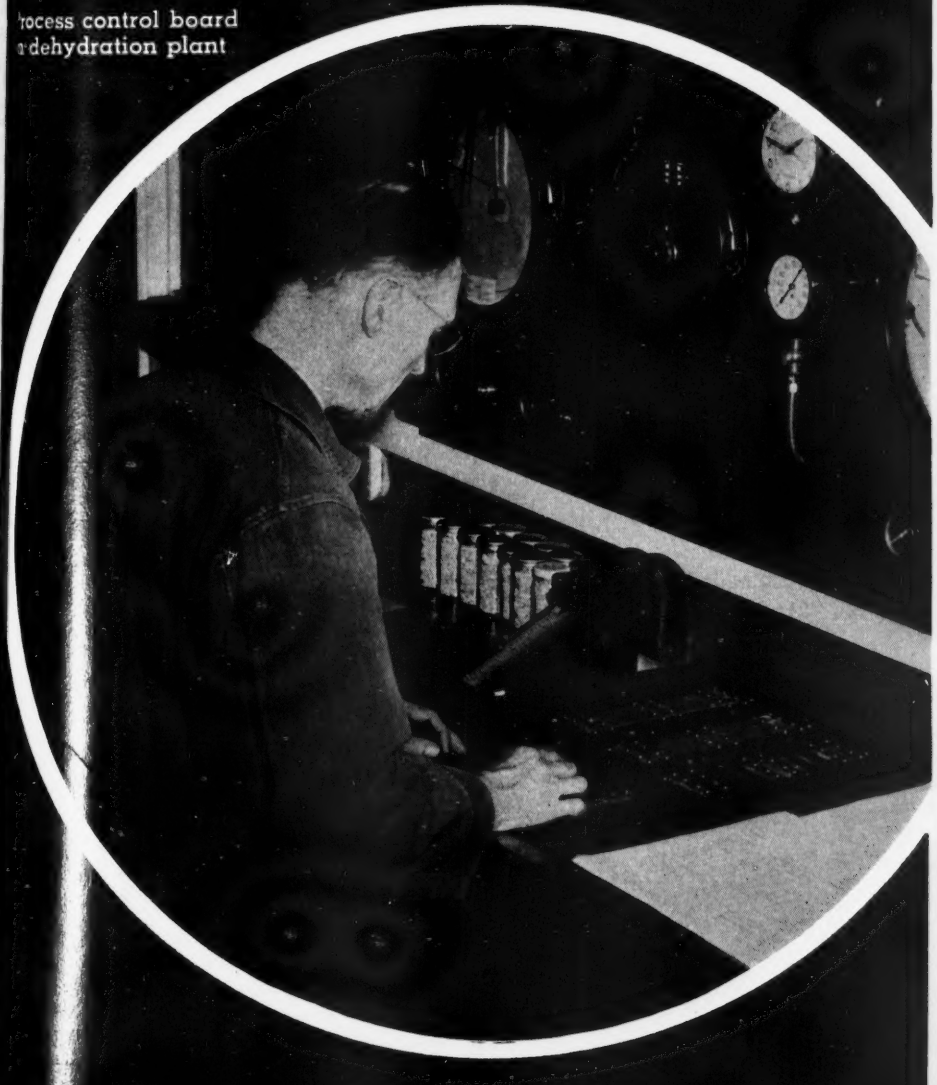
JUL 5 1944

FOOD INDUSTRIES

• FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION



rocess control board
dehydration plant

APRIL 1944

A Better Process Of Dehydration

Characteristics Of Oil of Anise

Simple Device Determines Quality

Lard Protects Meat In Freezer Storage

Skip-a-Day Delivery Reduces Cost

New Way to Dry Salt Cod Fish

Crude Pectin From Cannery Waste

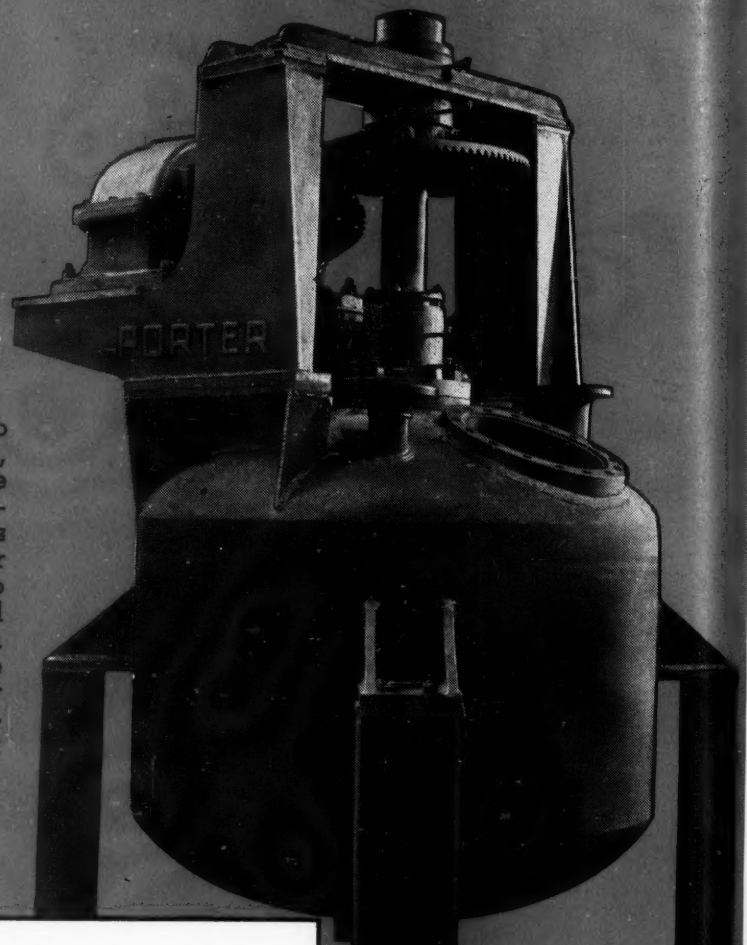
McGRAW-HILL PUBLICATION

PORTER

Better-Built PROCESS EQUIPMENT

will help solve your re-conversion problems Now

Post-war adjustments are bound to bring changes in raw materials, products, and processes. You can be sure Porter Equipment installed today will take such changes in its stride. Substantially built, Porter machines are readily adaptable to the ever-changing technique of food processing. Thoroughly modern in design, they do not quickly become obsolete. Begin now to meet your reconversion problems by standardizing on PORTER Better-Built Process Equipment.



500-Gal. Porter Agitated Pressure Vessel complete with 10 hp. agitator-drive. Built to ASME Code U.68.

ARMY E NAVY

PORTER "Better Built" Equipment
Established 1866

PROCESS EQUIPMENT DIVISION:
Agitators, Mixers, Blenders, Autoclaves
Kettles, Pressure Vessels, Driers,
Ball and Pebble Mills.

LOCOMOTIVE DIVISION:
Diesel, Diesel-Electric, Electric, Steam,
and Fireless Steam Locomotives.

QUIMBY PUMP DIVISION:
Screw, Rotex, Centrifugal, Chemical Pumps.

ORDNANCE DIVISION:
Projectiles, Heavy Forgings, Breech Blocks,
Winches.

H. K. PORTER COMPANY, Inc.

PITTSBURGH, PENNSYLVANIA

FACTORIES:

PITTSBURGH, PA. — NEWARK, N. J.
BLAIRSVILLE, PA. — NEW BRUNSWICK, N. J.

TECHNOLOGY

BAKING
Quality Control in Cracker Baking..... 142
CANNING AND PRESERVING
Grapefruit Cannery Waste Yields Crude Citrus Pectin 94
CEREAL PRODUCTS
Fermentation Inhibitors 141
DAIRY PRODUCTS
Foaming Influenced by Milk Proteins... 143
DEHYDRATED FOODS
Vitamin and Color Loss..... 144
Future of Dehydration Depends Upon Industry Cooperation 72
FATS AND OILS
Antioxidants Patented 144
FLAVORINGS
Production and Characteristics of Oil of Anise 79
FOOD CHEMISTRY
Protein Hydrolysis Made More Efficient. 145
PLANT MANAGEMENT
Waste Fat Recovery..... 141
PROCESSING
Better Way to Dry Salt Fish..... 90
1 Percent Moisture Attained by Vacuum Dehydration 67
QUALITY CONTROL
Simple Separator Speeds Grading..... 82
STABILIZERS
Chocolate Plasticizer 146
Agar Substitute 146
STORAGE
Blast Freezing 141
Fat Coating Protects Meat Against Freezer Burn 84
New Facts About Packaging and Storing Dehydrated Foods..... 76

THE COVER

The brain of the Vacu-Dry low-temperature dehydration process is shown on the cover. It is the vacuum and temperature control board. The operator is checking the fruit temperatures with a thermocouple potentiometer. (See article on page 67 for details.)

DISTRICT MANAGERS

NEW YORK 18.....A. G. Sutherland
330 W. 42nd St. Medallion 3-0700
BOSTON 16.....W. Donald Boyd
1427 Statler Bldg. Hubbard 4911
ATLANTA 3.....Ralph Maultsby
1011 Rhodes Haverty Bldg. Walnut 5778
CLEVELAND 15.....Thomas E. Taylor
1510 Hanna Bldg. Main 3981
DETROIT 2.....H. P. Ruprecht
2-144 General Motors Bldg. Madison 6024
CHICAGO 11.....A. E. Del Gado
520 N. Michigan Ave. Whitehall 7900
PHILADELPHIA 2.....Ivan C. Miller
16 S. Broad St. Rittenhouse 0670
ST. LOUIS 8.....G. G. Sears
3615 Olive St. Newstead 7600
SAN FRANCISCO 4.....J. W. Otterson
68 Post St. Douglas 4600
LOS ANGELES 13.....Roy Phelan
601 W. Fifth St. Michigan 3873

McGRAW HILL PUBLISHING CO., INC., James H. McGraw, Founder and Honorary Chairman.

PUBLICATION OFFICE: 99-129 North Broadway, Albany 1, N. Y. Return postage guaranteed. EDITORIAL AND EXECUTIVE OFFICES: 330 West 42nd St., New York 18, N. Y.

BRANCH OFFICES: 520 North Michigan Ave., Chicago 11; 68 Post St., San Francisco 4; 738-9 Oliver Bldg., Pittsburgh 22; Aldwych House, Aldwych, London, W.C. 2; Washington 4; Philadelphia 2; Cleveland 15; Detroit 2; Los Angeles 13; St. Louis 1; Boston 16; Atlanta 3.

JAMES H. McGRAW, Jr., President; HOWARD EHRLICH, Executive Vice-President for Business Operations; JOHN ABBINK, Executive Vice-President for Editorial Operations; CURTIS W. McGRAW, Vice-President and Treasurer; JOSEPH A. GERARDI, Secretary, and J. S. BLACKBURN, Jr., Director of Circulation.

CABLE ADDRESS: "McGRAW-HILL, N.Y." Member A.B.P. Member A.B.C. Contents indexed monthly in Industrial Arts Index. Copyright, 1944, by McGraw-Hill Publishing Co., Inc.

FOOD INDUSTRIES

M. A. WILLIAMSON, *Publisher* — LAURENCE V. BURTON, *Editor*

E. S. STATELER, *Associate Editor*, Chicago — G. L. MONTGOMERY, *Associate Editor*

F. K. LAWLER, *Managing Editor* — HILDA G. HOWE, *Art Editor*

C. R. HAVIGHORST, *Assistant Editor*, San Francisco — GRACE HIGHTOWER, *Assistant Editor*

R. S. McBride and Paul Wooton, Washington, D. C. — S. T. Henry, Spruce Pine, N. C. — Earle Mauldin, Atlanta, Ga.

Vol. 16, No. 4

APRIL, 1944

SPECIAL FEATURE

Editor Lends Australia a Hand.....*By M. A. Williamson* 65

DEHYDRATED FOODS

1 Percent Moisture Attained by Vacuum Dehydration *By C. R. Havighorst* 67

Future of Dehydration Depends Upon Industry Cooperation *By Fred H. Dellwo* 72

Dehydrating Sweet Potatoes..... 74

New Facts About Packaging and Storing Dehydrated Foods —Part III....*By Research Staff, Continental Can Co.* 76

MATERIALS

Production and Characteristics of Oil of Anise *By Ernest Guenther* 79

QUALITY CONTROL

Simple Separator Speeds Grading.....*By E. L. Birdsall* 82

Coating of Fat Protects Meat Against Freezer Burn *By R. L. Hiner and W. R. Kauffman* 84

MANAGEMENT

Skip-a-Day Delivery Makes Big Savings..... 88

First-Aid Fire Fighting..... 89

PRODUCTION

Better Way to Dry Salt Fish *By Arnold Weisselberg and Hermann Weisselberg* 90

ENGINEERING

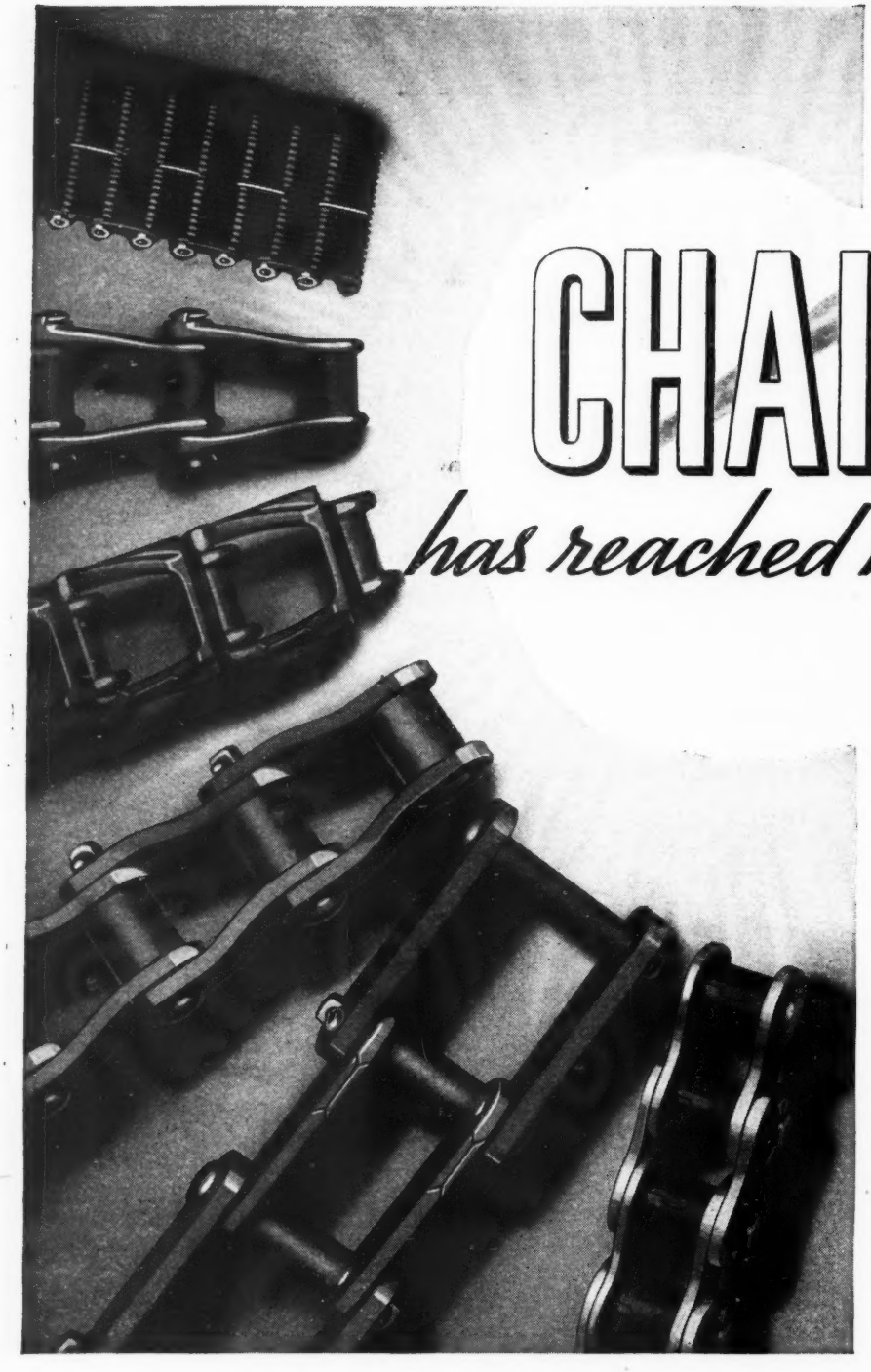
Higher Voltage Saves Copper..... 93

RESEARCH

Grapefruit Cannery Waste Yields Crude Citrus Pectin *By G. N. Pulley, E. L. Moore and C. D. Atkins* 94

EVERY MONTH

Editorials ..... 65 and 97
Talk of the Industry..... 66
Automotive 88
New Packages and Products..... 100
Food Industry News..... 105
Indicators 112
OPA Price Regulations..... 114
WPB Orders 115
WFA Orders 116
Capital Views 118
Men, Jobs and Companies..... 121
Food Equipment News..... 125
Letters to the Editor..... 129
Catalogs and Bulletins..... 131
Books 132
Patents 138
Food Technology—Abstracts 141
Questions and Answers..... 147
Formulas 149



CHAIN *too,*
has reached new ceilings!

● Flying and fighting seven miles up, the modern war plane, capturing our fascinated wonder, is the symbol and the result of vast developments in every sphere of science and industry. In that plane, as in the plant that built it, and throughout industry today, power is produced, applied and controlled more efficiently because of continuing and accelerated engineering progress.

Chains used today for aircraft controls, for tanks, trucks, jeeps and other motive equipment, for conveying and mechanical power transmission throughout industry, have been vastly improved to meet today's exacting demands. Link-Belt engineers and metallurgists have perfected lighter, stronger, more precisely built chains of every type, answering, even anticipating, the needs of our production and fighting forces. Now, more than ever, Link-Belt is the recognized source for chain, and for the engineering service to aid in utilizing these newer, better chains to the great advantage of all industry.

Consult Link-Belt on any problem relating to mechanical power transmission, materials handling or conveying. You are assured of reliable, unbiased recommendations and of efficient, economical equipment.

LINK-BELT COMPANY

The Leading Manufacturer of Materials Handling and Power Transmission Machinery

Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Toronto 8. Offices, warehouses and distributors in principal cities.

9376-A

Chicago Plants · Indianapolis Plant · Ordnance Plant

LINK-BELT

THE SYMBOL OF QUALITY · LINK-BELT COMPANY

CHAINS AND SPROCKETS

for conveyors • for drives • for power transmission

FOOD INDUSTRIES is published monthly. Price 35c per copy. Allow at least ten days for change of address. Publication Office, 99-129 North Broadway, Albany, N. Y. All communications about subscriptions should be addressed to the Director of Circulation, Food Industries, 330 West 42nd St., New York 18, N. Y. Subscription rates: United States and Possessions, Mexico, Central and South American countries, $3 a year, $4 for two years, $5 for three years. Canada, $3.50 a year; $5 for two years; $6 for three years (payable in Canadian or U. S. Funds). Great Britain and British possessions, 30 shillings for one year, 60 shillings for three years. All other countries, $5 a year, $8 for two years, $10 for three years. Entered as second-class matter, Aug. 17, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879.

Disposal of Government War *Plants and* Equipment

In the last four years, the Federal Government has spent over fifteen billion dollars on war plants—two-and-one-half times as much as was spent by private investors.

Of this fifteen-billion-dollar government investment, about one-third has gone into facilities for the manufacture of aircraft and for ship construction and repair; another third has gone into plants for production of combat ordnance; and the remaining third has gone into a variety of facilities for making synthetic rubber, metal products, machinery, and miscellaneous equipment.

Most of these plants are in industries that are expanded far beyond peacetime requirements. Furthermore, their convertibility to other civilian uses will, in many cases, be complicated by their specialized equipment and layout, by their tremendous size, and by their uneconomic location. At the moment, it looks as if roughly one-third of the government-owned plants and equipment can be converted fairly readily to peacetime operation, and will, therefore, be easily disposable to private enterprise.

The discovery of unsuspected uses for war plants and equipment may well raise the disposable proportion to one-half or more. The government, at the end of the war, may own about one-eighth of the commercially-usable industrial capacity of the country. It will be by far the largest owner of machine tools; it will own enormous aluminum capacity, magnesium capacity, many miles of pipe lines, and more ships than the entire private shipping industry.

What the government does with its war plants will have a profound effect on the free enterprise system and on all workers, employers, investors, and consumers who have a part in that system. If this problem is handled badly, we may find ourselves enmeshed in a trend toward monopoly and government operation of industry. If the problem is handled well, we shall have taken a big step toward freedom of action in a competitive society, toward full opportunities for business enterprise, toward well-paid productive jobs for workers, and toward a higher standard of living for us all.

Recently, three important events have signalled encouragement. They are the report of Senator George's Committee, the Baruch report, and the report of Senator Truman's Committee. These reports are noteworthy for their competent sizing up of a complex problem, for their recognition of the major responsibility of government in making a successful transition to peace, for their insistence on wise policy and good administration, and for their genuine concern that our productive powers be given full opportunity in a free private enterprise system. These reports agree on basic principles and many specific lines of action. There are, however, important areas of policy formation, organization, and procedure—especially in regard to plant disposal—which remain to be blue-printed.

In formulating the policies and practices to be followed in dealing with government war plants, our major goal must, of course, be a high level of production and employment in private business after the war.

Government operation in competition with private employers and privately-employed workers will not be desirable because it will make investment unattractive to private capital and will limit opportunities for private employment. On the other hand, sales to private buyers which result in increasing the concentration of industry will also be undesirable. We must use this opportunity to strengthen the competitive enterprise system and to move away from, not toward, the concentration of economic power in either public or private agencies.

To accomplish these objectives, a program of action such as follows will be necessary:

1. An adequate reconversion organization will be needed in the government, but its powers and responsibilities should carefully be defined by Congress. Fortunately, an able Administrator of Surplus War Property already has been appointed. It will be essential for him to work in closest cooperation with Congress and with the Armed Forces and other executive agencies. The Office of War Mobilization, and ultimately the President, must be responsible for seeing that the Surplus War Property Administration is not sidetracked by the operating agencies and is not dominated by their sheer size. Funds must be supplied generously to the Surplus War Property Administrator, so that he can set up an organization adequate to cope with this huge and complex job. Business, too, must be generous in loaning top-flight executives for postwar government service.

2. One of the first acts of the Surplus War Property Administration will have to be to assemble a complete inventory of government war plants and equipment, to make possible the planning and control of the disposal process, and to form the basis of catalogues of property available for sale.

3. Cooperation between the executive and legislative branches of the government will be needed to develop at least tentative plans with respect to matters of public policy which are of special importance to a successful transition to peace. Among these matters are the size of the military establishment to be maintained in time of peace, the stand-by facilities and reserves of materiél necessary for our security in case of future war, and our policy regarding import and production of synthetic rubber and other critical and strategic materials.

4. The Surplus War Property Administrator should

obtain from the Armed Forces, acting under congressional directives, specification of those plants which are needed to supply our peacetime Army and Navy and to provide the essential reserve capacity in case of war.

5. The Surplus War Property Administrator should select certain war plants as depots in which to store the huge surpluses of inventories and equipment which will have to be removed from private and government-owned factories in order to make possible their conversion to civilian use.

6. Those plants which are not desired by the Army or the Navy, which are not needed for storage, and which clearly will be unsuitable for peacetime utilization should be scheduled for dismantling and disposal piecemeal.

7. The two or three billion dollars' worth of government facilities intermingled with private plant should receive attention with a view to early sale, temporary continuance or use under lease, or early removal.

8. The various plants and pieces of equipment available for sale to private business should be classified conveniently, catalogued, and advertised to prospective buyers or lessors. Before the Surplus War Property Administrator offers, for private sale, plants and equipment not desired by the Army or the Navy, he should ascertain whether the plants or equipment are desired by other branches of the government or by public corporations such as the T.V.A.

9. Whenever property can be sold at prices approximating depreciated reproduction cost, that will be by far the best solution. Generous time-payment terms should be offered. In many cases the government may be unable to sell the property for reproduction cost less depreciation, for the simple reason that no one would think of reproducing it. The property may already be partly obsolete or, because of its size, location, or other characteristics, may only be moderately well suited for commercial use. This should not prevent the government from selling it, provided a price which fairly represents the worth of the property can be obtained. The best test of that worth is the price produced by active bidding under favorable market conditions.

10. When property cannot be sold at a fair price, temporary leases with options to buy should be employed to get the facilities into productive use. This should not, however, be done on terms which would cause unfair competition or create clearly excessive capacity in an industry. And the lease must be temporary; it must not be the means to prolong government control or ownership.

11. The government should offer the strongest possible resistance to local groups or industry groups seeking subsidies for continued operation of war properties. Subsidies will burden the Treasury and lead to inefficient use of resources. They will be justified only to maintain facilities needed for national security.

12. The plants and equipment offered for sale and lease should include sufficient quantities in small enough lots to satisfy the demands from small business. The war has tended to concentrate production in larger plants. After the war, we should seek a wider distribution of the government war facilities.

13. Insofar as possible, war buildings and equipment should be offered for sale in units which can be purchased by businesses in peacetime industries. Many of these industries have had to get along during the war without adequate replacement and expansion, and will be ready to buy if they are able to get what they want from the government. This is a particularly desirable market for surplus government property since these industries are, for the most part, not faced with the problems of excess capacity.

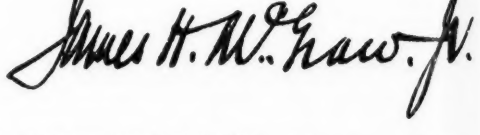
14. Property, such as machinery and other movable equipment, which is in excess of our domestic requirements or is more urgently needed by other countries, should be exported. We shall need, and can take, large supplies of raw materials in return.

15. Property which is not needed by the Armed Forces, which cannot be sold or leased on terms which would be fair to competing plants, which cannot be dismantled and distributed piecemeal, and which cannot be sold abroad, should be scrapped as soon as its non-disposability is apparent. The disposal of war plants should be completed within three to five years.

16. All negotiations for sale or disposal should be matters of open public record. As Mr. Baruch has said, the process must be conducted in a goldfish bowl. This is as much for the protection of business as for the protection of the government.

These courses of action do not include everything that must be done, but they do indicate the general lines along which our surplus war plant disposal must proceed if it is to avoid precipitating needless transition unemployment.

The gravest danger of all will be red tape, intergovernmental conflict, and inadequate administration. It would be a great misfortune for the executive and legislative branches to quarrel over details of organization when they agree on the basic principles to be followed in handling the problem. Obviously, the Surplus War Property Administration must cooperate with Congress and look to it for policy guidance. Just as obviously, the disposal problem will involve great difficulties of administration which must not be complicated by congressional interference. We shall need the best we can get in careful policy making, detailed planning, good organization, and courageous action. This is a matter of vital importance to every American. The stakes are too high to tolerate poor administration or petty politics.



President, McGraw-Hill Publishing Company, Inc.

Editor Lends Australia a Hand

WHEN the war came, FOOD INDUSTRIES never expected to send a member of its staff to a far corner of the world in a war correspondent's uniform. But it has. Editor L. V. (Larry) Burton is in Australia in the uniform you see him wearing in the picture. He is not there, however, in the capacity of a news reporter. He's there at the urgent request of the Australian government to act as a technical advisor on some mighty tough food problems down under. These problems have grown out of a tremendously expanded food production and processing program—a program to supply food to American soldiers in the South Pacific as well as to England and to Australia's own civilian population.

Our other ally down under, New Zealand, is in the same boat and is rowing with the same oars as Australia. And while he's on that side of the globe, Larry likely will visit New Zealand in the same capacity in which he has gone to Australia.

This is no sight-seeing trip that Larry has gone on. He has a job to do, a job that will keep him busy night and day and utilize his wide knowledge of food technology and of practical every-day food plant practices.

The significance of his trip goes even beyond the vitally important task of helping to meet the wartime food needs of the Allied Nations. It has a bearing upon the global picture of the postwar food economy. Australia and New Zealand have taken terrific strides in increasing food production and expanding food processing. And they are by no means yet ready to level off. What will their increased food production mean in postwar? What developments are being made in production and processing that food men in this country ought to know about? What will be the requirements there for food plant equipment and supplies? We don't know, now. But we shall when Larry gets back—and so will you when you read what he writes.

Busy with our own forced-draft food program and its ever-changing problems, we sometimes don't realize what other countries are doing. So let's pause a moment and look far into the Southwest.

Let's see what Lend-Lease Administrator Stettinius saw when he made his report to Congress more than a year ago. In that report he stated that Australia and New Zealand had between them provided more beef to the American forces than the United States had shipped overseas under Lend-Lease during the same period. In 1943 this contribution was maintained and here are the figures for the quantities of various foods supplied throughout the year (in pounds): butter, 14,210,000; cheese, 3,855,000; fresh and frozen meat, 77,800,000; canned meat, 44,270,000; bacon and ham 23,170,000; canned milk, 8,084,000; sugar, 39,600,000; tea, 674,000; jam, 3,166,000; potatoes, 32,000,000; onions, 10,000,000; other fresh vegetables, 9,734,000; apples, 14,900,000.

But that was last year. In 1944 the story will be even bigger. In little New Zealand alone the 1943–44 production program envisages the cropping of 5,000 acres, from which over 78,400,000 lb. of vegetables will be supplied to American forces throughout the Pacific. Australia's 1944 food goal is in proportion. To take an example, the increase in the production of canned fruit is set at one and a half million cases.

These increases involve the opening up of new agricultural areas, the building of new plants, the adoption of new and unfamiliar methods, including dehydration.

Yes, the wartime food problems of the Allies are many and difficult. But few will be as trying as the job New Zealand undertook when in 1941 she started a shipment of pedigreed sheep to China to improve the quality of China's flocks. When Hong Kong fell, the shipment had to be diverted to India. The sheep have, however, been driven on foot from India, across the passes of the Himalyas to Tibet, where they are steadily nibbling their way towards China.

In three or four months we expect Larry back, so we hope he doesn't try to drive any sheep to China.

W. A. Williamson

PUBLISHER

The Talk of the Industry

• THE English have had considerable difficulty with our Cheddar cheese packages, and the cheese is not quite the type the British have been accustomed to. Withal, American Cheddar is a fast-moving food in English retail stores. Wise cheese manufacturers in the U. S., however, will not bet too heavily on a continuation of this popularity of scarcity after the war.

• ILL-CONSIDERED price ceilings sometimes have strange effects, as the rice millers in Louisiana can tell you. When ceilings were put on processed rice but not on the raw product a most unfortunate situation developed. Brewers were able to outbid the rice millers for the grain. Many mills were forced to close and others to look for loopholes in the regulation. Maybe the OPA thinks rice is just a kind of confetti to use at weddings.

• IT appears that General Motors Corp. is the first firm to develop a complete postwar plan and announce it. GM is to spend $500,000,000 to reconvert its plants. The reconversion cost is based on a predicated $100,000,000,000 national income as compared to $70,000,000,000 in prewar years.

It might be worth your while to remember that estimated $100 billion income. Some folks in Washington are talking in terms of $130 billions.

• A FULL-SCALE test of the ability of echo-sounding devices to locate schools of fish is being arranged by the office of the Coordinator of Fisheries and the Navy. To be made off the coast of California, the main objective of the test is to help fishermen to catch pilchards which are now being caught during the dark of the moon. If the sounding devices prove successful, continuous fishing during the season will be possible. This, in turn, would mean more efficient utilization of fish canning and processing equipment. Just one example of what may be done with wartime gadgets in peacetime pursuits.

Save paper.

Conserve paper.

Collect scrap paper.

There is no available substitute for paper

• AN oddity is that never, since this publication was founded in 1928, has any manufacturer of butter or margarine suggested that we take sides in the perennial controversy between those who are for or agin' margarine. Even during the recent ineffective effort to lift the Federal tax on margarine the only proddings came from dairy-farmer groups. One wonders if these organizations realize that margarine cannot be made satisfactorily without milk?

All that is accomplished by the continued agitation by dairy farmers and dairy cattle breeders is to compel continued research to improve margarine quality. If this ill-advised hell-raising keeps up long enough, the day will surely come when margarine quality will be improved to the point where it can command a premium price over butter.

Before you start to denounce us, please reflect on the prewar intercommodity competition between hydrogenated vegetable oil shortenings and lard. The former has commanded a premium price over lard for many years.

Butter and margarine are both manufactured products, both are made from domestic raw materials, both require milk, and both have a big market.

Hors d'Oeuvres

• *In the high-income year of 1943, people in this country ate more fats, proteins carbohydrates and calories than in 1939, OPA rationing notwithstanding. Apparently dollars are more potent than points.*

• Production of ammunition containers and torpedoes lifted the total output of American Can Co. to a new high in 1943. That's fine, very fine. But here's hoping they don't get any shipments mixed up.

• *After the war the housewife will be able to make milk from the contents of a cardboard carton and water from the kitchen faucet. Maybe the milkman will be obsolete. Then who will hold the house still while you put the key in the door after a night out?*

• A protent antitank grenade is being made from the one-quart, flat, rectangular can used for insecticides. Just the thing to use on thick-shelled roaches.

• *According to a report from Holland, the Nazis have looted 75 percent of the nation's wine stocks—the swine, vermin and so on.*

• Know what's a fox? That's a wolf who sends candy. And while on the subject, a gentleman is a patient wolf.

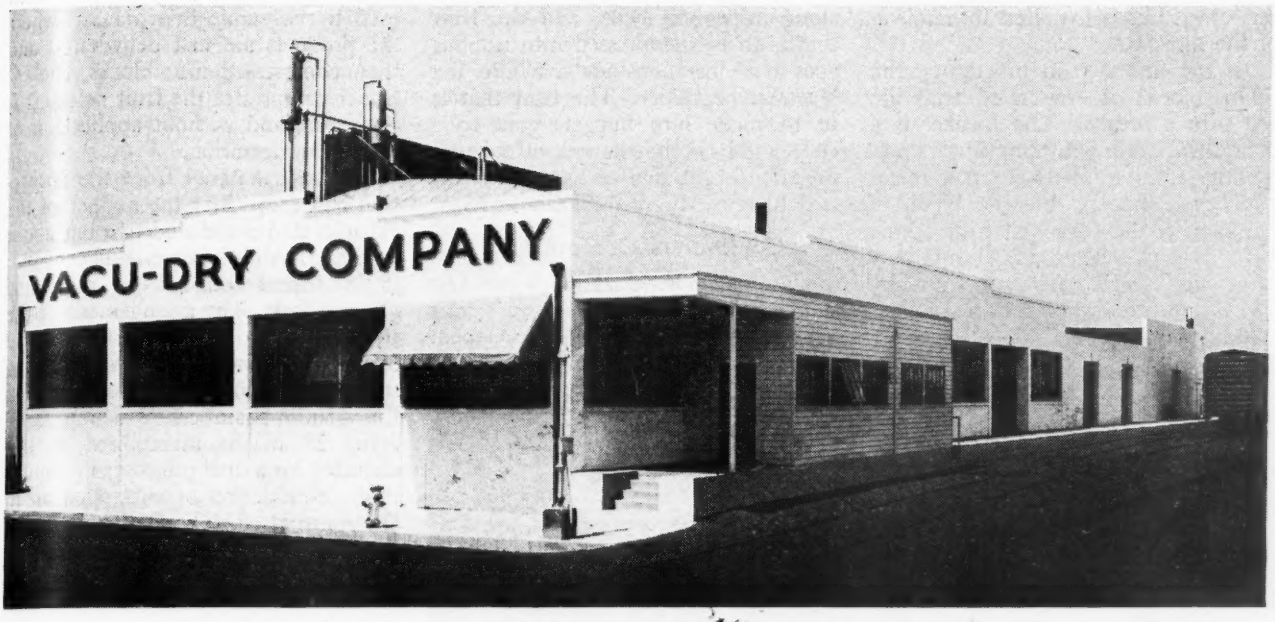
• *Jack Simplot—the Idaho potato and onion king and the operator of one of the largest dehydrating plants in the country—will build a million dollar fertilizer plant. Move over, Mr. Kaiser.*

• Navy scout planes at Guadalcanal dropped Japanese beer bottles on the decks of Jap warships at night. This excited the Nips into firing and revealing their position to our P-T boats. The rest is as you imagine. They say Hirohito was all hopped up about the beer bottle business.

• *Research has discovered another use for the corncob. Ground cobs blown from a sand-blasting gun will remove organic and soft mineral deposits from machine parts without damaging the metal. Ground peanut shells will do the trick, too, but ground rice hulls are slightly abrasive because of their high silica content. Maybe you could get a quick, dry shave with the stuff.*

• "Jap Beetle Grubs Succumb to Disease," says the head on a news release. Yep, Jap pests have been found vulnerable to several types of exterminators.

• *Walt Disney has established an industrial films division and will do funny flickers for Owens-Illinois. The company is probing the possibilities of using such films for the indoctrination, training and entertaining of workers, in selling and in customer service and in public relations generally. What would this country do without Mickey Mouse?* F.K.L.



The Vacu-Dry plant, located on main line of the Santa Fe and adjacent to main trucking highways.

1 Percent Moisture Attained By Vacuum Dehydration

By C. R. HAVIGHORST, Assistant Editor of "Food Industries," San Francisco.

Foods with better keeping quality produced by Vacu-Dry by low-temperature dehydration in vacuum chambers of own design. Company also uses continuous compression machine to form products into ribbons before drying

WHEN the war broke out,, Vacu-Dry Co., Oakland, Calif., was the country's major source of dehydrated fruits of extremely low moisture content. And to meet the large orders from the Army and Navy, production capacity was increased more than 150 percent. To share the load, Appella Corp., Selah, Wash., a Vacu-Dry licensee, also increased its production. Today, four concerns supply the armed forces with dehydrated apples, with Vacu-Dry leading in volume of production. The company also dehydrates other fruits and fruit products, but this activity is now on a limited scale, since Army and Navy orders for dehydrated apples takes precedence.

With the exception of evaporated apples, most of the raw materials are secured from orchards within a 100-mile radius of the plant's location. Washington's Yakima-Wenatchee apple-growing sections now provide the necessary additional supply of raw materials.

The Vacu-Dry process utilizes evaporated or dried fruits which contain approximately 25 percent of moisture. This type of material provides a stable source of fruit. A year's supply can be contracted for during the growing season and processed throughout the year. Thus, the plant is not faced with seasonal shut-downs.

For the present, and perhaps for the duration of the war, dehydrated apples in compressed and nugget form are the principal products produced by the Vacu-Dry plant. This is due, of course, to Army and Navy requirements. However, prior to Pearl Harbor, Vacu-Dry produced dehydrated apples, apricots, dates, figs, peaches, pears, prunes and nectarines—both in nugget and powder form—raisin puffs (an aerated form of nugget), all-fruit mincemeat and Norwegian fig pudding. Other fruit puddings and beverage mixes are now in the experimental stage in the plant's laboratory and soon will be ready for military and civilian use.

These products, dehydrated to a moisture content of about 1 percent, have shown splendid keeping quality. Packaging is done in an air-conditioned room, and it is not necessary to use inert gas or vacuum in this operation. Under such unfavorable and extreme temperature conditions as are encountered in Africa and the South Pacific, there has been no report of spoilage. Temperature conditions that would tend to blacken and spoil evaporated fruits seem to have no effect on apple or apricot nuggets. The firm's record with the armed services shows only one lot rejected during two years of high-volume production, and that at the company's suggestion because of a valve failure.

Vacu-Dry has parallel production lines for preparing the fruit to be dehydrated in two forms—nuggets and compressed ribbons. The prepared

products from both lines go to a battery of vacuum dehydraters for removal of the moisture.

As the first step in processing, the 50-lb. blocks of evaporated fruit are fed into a breaker The breaker is a cylindrical drum with 2-in. fingers protruding from it, inclosed in a metal case. The fingers tear the block of fruit apart, the separated fruit falling through a grid below the drum. Any large chunks which fall on the grid are broken up there when the steel fingers pass through them.

The separated product is conveyed along inspection belts, and the fruit that is to be compressed into ribbons goes to an ingenious new machine, the Vacu-Dry extruder. The fruit that is to be made into nuggets goes to a chopper. In both instances, after being prepared in the desired form, the fruit is dehydrated in vacuum chambers.

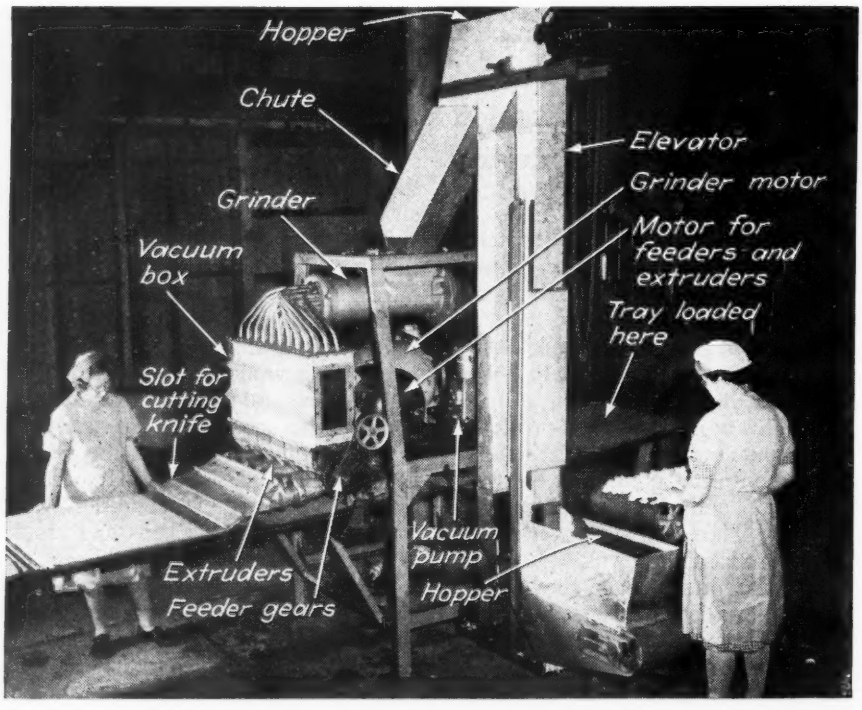
Continuous Compression

The Vacu-Dry extruder is the first practical and efficient continuous fruit compression machine to be developed. Unlike the methods that have been used by vegetable dehydrators, where the products are first dehydrated and then compressed into blocks, the extruder compresses the fruit before it is processed, and without application of heat or refrigeration.

The raw material from the inspection belt drops into the hopper of the extruder and is elevated to a bin above a grinder. After being coarsely ground, it is forced through a multitube vacuum lock. The arrangement of the tubes serves to distribute the ground fruit evenly on two counter-rotating screw feeders located at the bottom of the vacuum chamber. A vacuum, averaging 29 in., is maintained in this chamber for a dual purpose: Foremost, is the elimination of entrapped air in the compressed ribbons of fruit; under vacuum dehydration the air pockets would tend to expand and destroy the ribbon structure. Of secondary importance is fact that as the fruit emerges from the extrusion nozzles it is subjected to pressure by the atmosphere (normal atmosphere pressure is 14.7 lb. per square inch).

The two counter-rotating screw feeders at the bottom of the vacuum chamber of the extruder distribute the ground fruit uniformly and press it into six extrusion units directly below the chamber. These extruders force the fruit into 12 ribbon nozzles, from which it is fed onto trays that move on a conveyor under the machine. The trays are moved along at the correct speed by the pressure exerted by the ribbons of fruit. As the ribbons are deposited on the trays they are cut into uniform sections for convenience in later packaging.

W. E. Gallwey, president of Vacu-Dry Co., and his associate and vice-president, Frank P. (One Percent) Adams. Under Gallwey's direction the Vacu-Dry process was developed and patented.



The ingenious Vacu-Dry extruder. Evaporated apples are elevated by bucket conveyor to hopper above grinder. From grinder they are forced through tubes into vacuum chamber, the tubes forming a vacuum lock. Two counter-rotating screws distribute the ground apple and feed it evenly into six extruders which force the fruit through ribbon nozzles and onto trays that move on a conveyor under the machine.

Advantages of Compression

These compressed ribbons increase the load of apples on each tray to 22 lb., or three times the normal load of the loosely spread particles of fruit used in producing apple nuggets. Furthermore, the transfer of heat through a bed of loose fruit is efficient only when it is spread lightly on a tray. A thick bed of fruit would tend to scorch on top and bottom, with little dehydration taking place in the center of the bed. The compressed ribbons, however, form a good medium for efficient heat transfer, since the fruit mass is compact.

To attain Vacu-Dry's standard of 1 percent moisture content, the dehydration time for the ribbons is double that required for apple nuggets. But the net result of compressing the fruit before dehydration will amount to a 60 percent increase in production capacity, or approximately 25,000 lb. of finished products daily (a 24-hour day).

The compressed ribbon sections greatly simplify detraying. The product does not adhere to the trays as do the apple nuggets, and no tray scraping is necessary.

Although it requires slightly more time to fill a 5-gal. can with the compressed apple ribbons, this size container will hold 25 lb. of the product as compared to 12 lb. of apple nuggets.

The 60 percent increase in the output of vacuum chambers resulting from the use of compressed raw material has not disturbed the fixed operating cost of this process. And the economy in packaging is obvious when double the usual amount of products can be packaged in a container.

How Nuggets Are Made

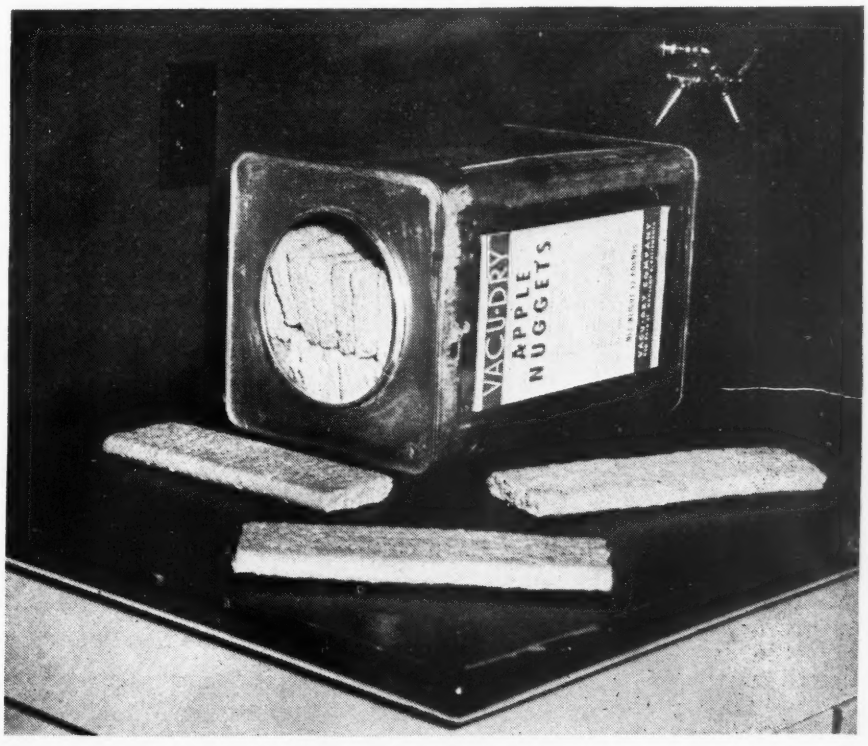
In the nugget process, the fruit discharges from the block breaker onto a 30-in. by 12-ft. inspection belt "manned" by three women. Here it is inspected for defective or unusable fruit. Then a 30-in. by 30-ft. conveyor elevates the fruit to the mezzanine of the plant where a grinder cuts it into small pieces. During a 24-hour day this grinder can handle up to 50 lb. of raw material.

Other fruits that require it are steamed and pitted on the mezzanine, to which they are conveyed by an inclosed screw conveyor. After grinding, these fruits are pressed into sheets $\frac{5}{8}$ in. thick and 40 in. wide, then loaded onto trays.

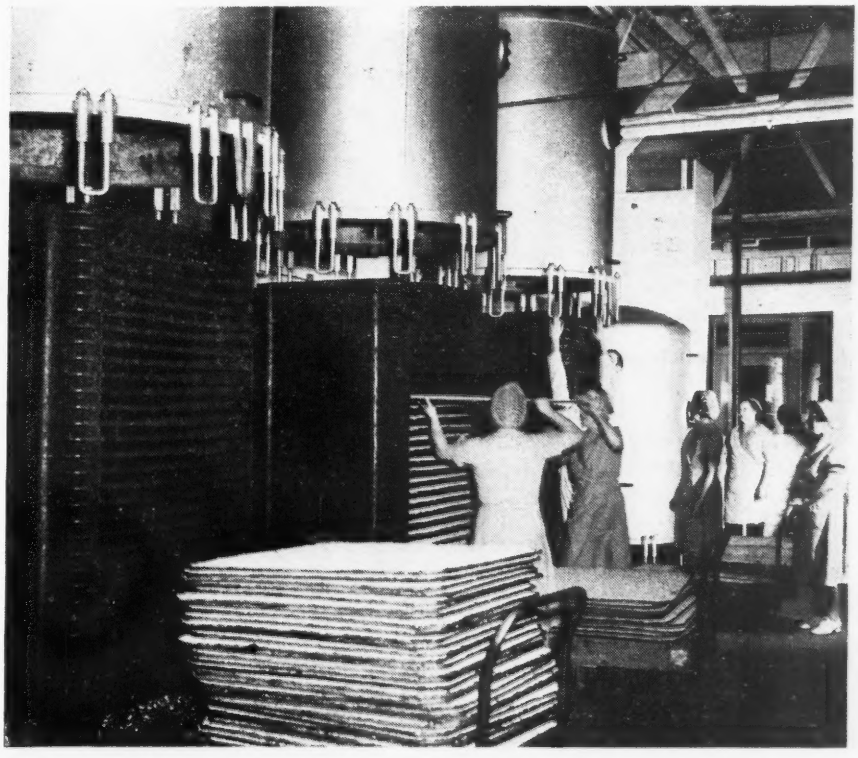
From the grinder the raw material is conveyed by chute to the loading bin on the main floor. There it is carefully weighed, $7\frac{3}{4}$ lb. to each 40x40-in. metal try, then spread evenly on the trays. Filled trays go to mobile racks (31 trays comprise a load) and are wheeled into position, facing the chamber, ready for loading. A batch of ground apples (four loaded racks, 31 trays to the rack) is composed of approximately 950 lb. of raw material. This will produce approximately 700 lb. of finished apple nuggets with a moisture content of 1 to $1\frac{1}{2}$ percent. Records show the largest part of the plant's production to be of 1 percent moisture content, or nearer to this figure than $1\frac{1}{2}$ percent.

Something New in Vacuum Dehydraters

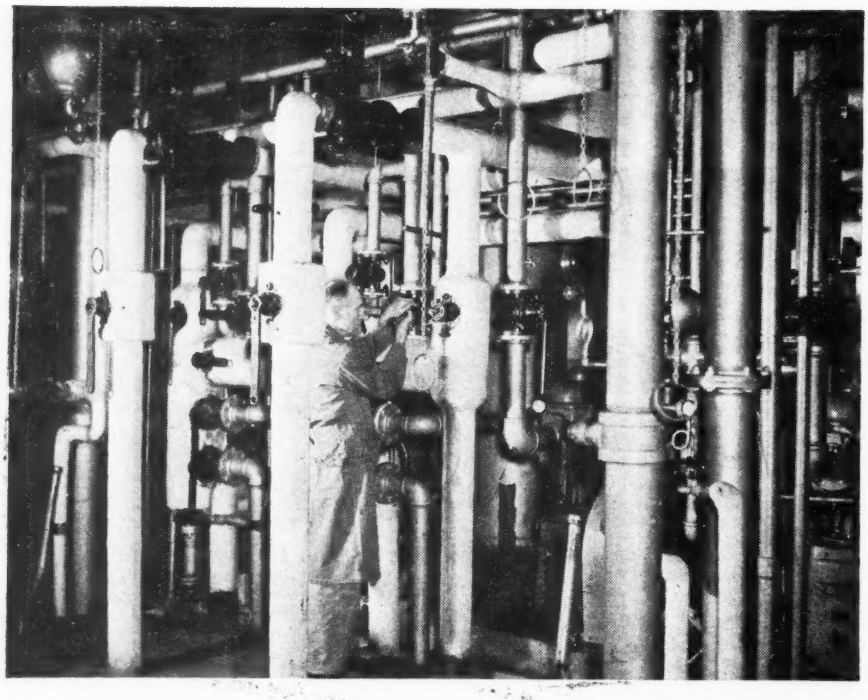
The vacuum chambers, in which both the nuggets and the compressed ribbons are dehydrated, are of Vacu-Dry's own design. Eight chambers, 5 ft. in diameter and 8 ft. high, are used, these being arranged in two banks of four chambers. Each bank is operated as a unit, with the flow of material alternating between each unit. Inside each chamber a stack of 32 radiator coils is suspended between four upright header pipes. The casing, or shell, of the chamber rests on a rubber-gasketed stage. The chambers are opened by elevating the entire shell, this being facilitated by counterweights. This design permits unloading from one side of the chamber while trays are loaded almost simultaneously from the other side.



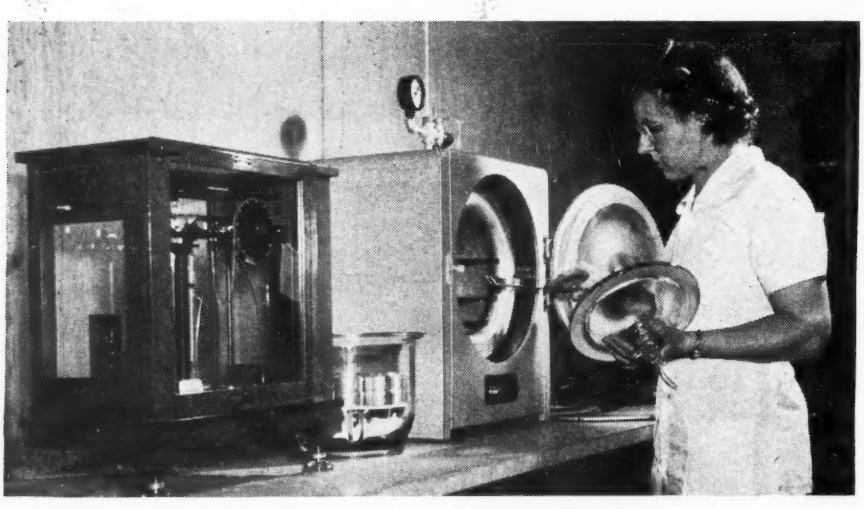
A 5-gal. can will hold 25 lb. of compressed dehydrated apples as compared to 12 lb. of apple nuggets.



A battery of four vacuum-dehydration chambers (there are four more parallel to these). Chamber in left foreground has been unloaded, showing banks of radiator coils. Number 2 chamber is being loaded; operators are raising the shell of No. 3; No. 4 is yet to be opened. Not seen in the picture is the loading crew, ready to reload the chambers from the other side.



Vacuum and temperature control valves. At the level of the operator's head are manual control valves, and above his head are Foxboro automatic valves. Lubricated plug valves are used for manual control. Vacuum pumps are seen in right background; steam-jet ejectors are also used in obtaining the desired vacuum.



A corner of the laboratory. The operator is making a moisture test of apple nuggets.

The banks of 32 radiator coils are so arranged that each try rests between two coils. Before closing the shell, three thermocouples are inserted in the fruit in selected positions throughout the load. By means of a potentiometer, located on the control board, the operator in charge of processing checks fruit temperatures at 15-minute intervals during the operation.

After the shells have been lowered into place against the gaskets and firmly positioned by a quick-clamping device, the vacuum and heat valves are opened, and within about five minutes the temperature is up to the processing point and a 28-in. vacuum has been obtained.

Because of the vacuum, the temperature of the fruit remains surprisingly low during the process. The bulk of dehydration takes place with fruit temperatures ranging between 100 and 135 deg. F. The temperature to which ground apples are subjected never exceeds the caramelization point of the fruit sugar. The radiator coils are supplied with hot water under a pressure of 130 lb. per square inch. Coil temperatures can be brought up to as high as 333 deg. F.

A processing and cooling time of two hours is required for the average batch of ground apples. The time cycle for other fruits is subject to considerable variation. Upon completion of the dehydration process, the product remains in the vacuum chamber and is cooled by the introduction of cold water into the radiator coils.

At the beginning of the operation a vacuum of about 28 in. is established. But as the process progresses, the vacuum is increased until at the end it is brought up to 29⅞ in. through the use of steam jets.

Trays of apple nuggets and other products are moved into an air conditioned room for unloading and packaging. A York air conditioner, supplemented by a Lectrodrier activated alumina absorption unit maintains the relative humidity below 25 percent, and temperatures are limited to 70 deg. F., or less. Apple nuggets are packed 12 lb. in each 5-gal. can.

The Most Important Factor

Precise control of temperature is the most important factor of the Vacu-Dry operation. This is accomplished by means of thermocouples inserted in the fruit, these sensitive elements actuating controllers that regulate the flow of steam to the radiator coils. To facilitate the work of the operator in charge of the dehydration chambers, a laboratory dehydration test (identical to the operation of the large commercial units in the plant) is made from samples taken from several boxes of each lot of fruit as it arrives at the plant. From this laboratory run an accurate temperature and time template is prepared. And when processing a batch taken from this lot, the operator inserts a template in the Foxboro automatic temperature control, and with the exception of the regular 15-minute temperature checks of the fruit made with the potentiometer, the temperature is automatically controlled.

When it is found necessary to run a batch by manual control of temperature, the laboratory provides the operator with a linear template which he places upon a temperature-time sheet. These temperature curves indicate the exact temperatures for the fruit and the radiators throughout the entire process. The operator then controls the temperature from this predetermined curve, checking the temperature of the fruit and the radiators through the potentiometer at regular 15-minute intervals to see that it follows that of the template design.

A set of three thermocouples is located in each of the dehydration chambers. Upon loading the chamber the operator inserts them into the fruit at various locations in the load. The thermocouples are connected to the control board and the operator can check the temperature of the fruit at

any time during the process by plugging into the proper jack and adjusting the dial on the potentiometer (see picture on cover).

Well-equipped Laboratory

As a guide to process control, and also for the development of new products, the company operates a well-equipped laboratory under the direction of Dr. Sylvan Eisenberg. Daily tests on the products in process are conducted in this laboratory, and many of the new products which the company plans to produce for postwar sales originated there.

Removal of SO_2

Vacu-Dry uses a method of alternating steam pressure and vacuum to remove every trace of sulphur from fruits which have been treated with SO_2 in the evaporating or predrying process. This operation is done at the very outset of the apple dehydration process, and is an important step in restoring the sulphured apples to their natural fresh flavor.

With a few changes this same process is used to achieve an entirely different type of product, known as "puffed nuggets." This product has a light, crisp texture.

Rapid Dehydration

The volume of reconstituted apples yielded by one 5-gal. can will serve apple sauce to 350 soldiers, or supply fillings for 43 generous 9-in. pies. The yield of one can of compressed ribbon product will be approximately double that of the nugget pack. Each pound of apple nuggets represents the equivalent of 10 lb. of fresh apples and will make about 8 lb. of apple sauce.

Vacuum dehydration has the effect of keeping the fruit cells in their natural open condition. And the pressure exerted by the extruder in forming the fruit ribbons is carefully gaged so that the fruit cells will not be injured. In either the nugget or the compressed ribbon there is no hardening or sealing of the cell case. Proper amounts of water, stipulated for each fruit, are added and the mass is soaked and cooked for a period varying from 10 to 30 minutes. Powdered fruits react even faster.

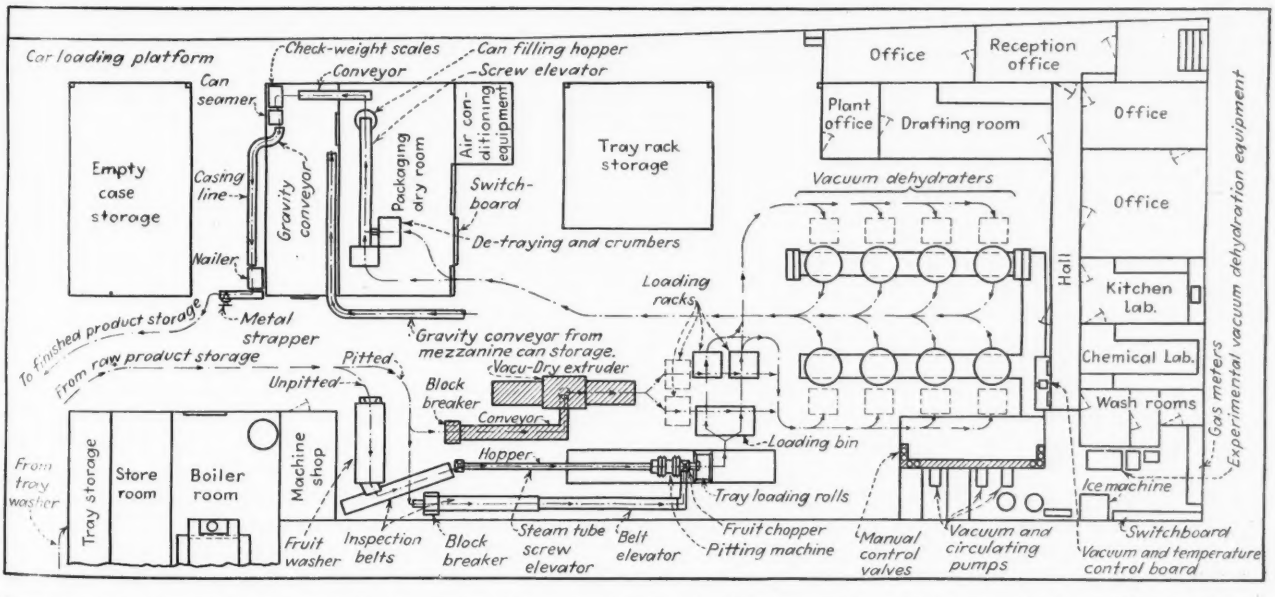
For bakery products, the dehydrated fruit nuggets frequently are added to the mix in the dry state without any preparation whatever; water is absorbed during mixing. A fair amount of latitude is permitted in the use of water volume, which merely produces a firmer or a looser consistency, according to the amount used. Tests have brought out that the natural texture and flavor of most fruits are not as easily lost in cooking as with some of the dehydrated vegetables.

Ready for Postwar

Peace will bring greatly changed conditions to this western plant, but W. E. Gallwey, of Vacu-Dry, anticipates little difficulty in making the adjustment "because we've been getting ready for it ever since the war began." The future of dehydrated foods in postwar markets is controversial. But Vacu-Dry's officials recognize the problems involved in future competition with other processed foods. The quality of the finished product on the consumer's table, ease of preparation, variety of uses and the factors of cost have been occupying their attention for a long time. One characteristic of their plans is the complete separation of Vacu-Dry's potential market from the inhibitions and limitations surrounding certain other dehydrated products.

Plans have been made to cultivate three markets—consumer, commercial and industrial. The company believes that the consumer market will be receptive to vacuum dehydrated fruits. It intends to rely largely upon a combination of mass-volume specialties for an entering wedge to these markets. The policy will be to offer a line of ready-mixed, easy-to-use products, having a pure fruit base, and to shoot at the market now dominated by desserts having synthetic flavors.

Active entry into the export market is also contemplated. Vacu-Dry is not unmindful of the prewar fact that the greater part of America's dried fruit output crossed the seas to foreign shores. Reasoning that vacuum-dehydrated fruit has a decided edge over the evaporated item in the export essentials of keeping quality and space-weight economy, the company sees potential markets abroad. Perhaps more significant than the plan these Californians are formulating is the motive that inspired them. Vacu-Dry antedates the war by a full seven years and does not intend to become a war casualty. Today every decision is weighed in terms of its probable effect on the ultimate objective—the creation of a world-wide market for vacuum-dehydrated fruits.



Floor plan showing the flow of products through the process and the efficient layout of the processing department. Starting from the warehouse in rear of plant (not shown), the products in process follow a U-shaped course through the preparation lines to dehydration chambers and thence to the packaging department and to storage. Four carloads of raw material and seven cars of finished product are accommodated by the warehouse in rear of plant.

Future of Dehydration Depends Upon Industry Cooperation

By FRED H. DELLWO, Food Technologist, Burlington, Wash.

Dehydrators have everything to gain and little to lose by a free exchange of the know-how they have acquired. It would speed the development of the industry and help to secure its future. The author tells why

IN the general picture of food preservation by dehydration in the Mid-West and along the Pacific Coast, there appears one outstanding principle which can do more to advance the industry than any other. If it were possible for dehydrators to hold open house for one another and thereby share each other's ideas of unit operations, processes and equipment design, much could be learned in a short time that is now taking entire operating seasons to learn.

Perhaps they would discover that the methods which they have jealously guarded as secrets are being used by dehydrators in other sections of the country. In one particular case, a dehydrator who regards his equipment as secret is using the original basic model to which there has been no modification or improvement. At the same time, a dehydrator in another section is using the same basic idea, but with modifications. By combining the ideas of these two, and for good measure throwing the idea open to the industry, much could be accomplished to the benefit of all.

It is true that efforts have been made to advance and spread the new knowledge of dehydration. I refer to the sectional dehydration schools and seminars which have been held at intervals, Those who attended these schools come away amply repaid for any effort they may expend. Then, too, many of our universities are doing a vast amount of research on dehydration. At Albany, Calif., the Western Regional Research Laboratory of the U. S. Department of Agriculture has devoted a major portion of its staff and facilities to dehydration research. This is truly a source of unlimited assistance for those who care to avail themselves of it. Yet, it would appear, from conversations with some of those in charge of dehydration production, that they had never heard of these institutions.

Because dehydrators often fail to acquire adequate know-how, there are many cases of misapplication of dehydration equipment.

Here are some of them: a tendency to use a conveyor chain which is too light for the load, reduction drives not capable of transmitting the input horsepower, single V-sheaves where multiple sheaves are required, cast iron bearings where the application would require antifriction bearings. Many such instances have been excused on the basis of economy and attempting to use what is available.

But when the equipment breaks down, it becomes apparent that such economies are not justified. True, repairs can be made. But perishable food cannot be rejuvenated once it has spoiled. Many times a breakdown in the weak point of a chain results in further equipment damage before the power to a unit can be disconnected. In the final analysis, more equipment is used than would have been required to build an adequate set-up originally. Specifically, the greatest single case of inadequate equipment was noted where detachable chain designed for approximately 4,000-lb. breaking strength was being used in a drive that would normally require a pintle-type chain of 10,000-lb. breaking strength. Ironically enough, chain suppliers are frequently accused of furnishing inferior material, and the true facts are hidden under blustering condemnation.

In all fairness to dehydrators, it should be said that cases exist today where canners, after having been in the business for many years, have not yet learned that there are limits to the capacity of materials-handling equipment. What stories could be told if equipment could talk!

The need for exchanging ideas is further emphasized when you consider the many methods in use for peeling potatoes. Here's a list of them:

1. Hot water scald, followed by: (a) Abrasive peel—continuous and pot type. (b) Pressure water sprays under nozzles of various design.
2. Lye peeling—both low and high concentration, followed by: (a) Continuous abrasive peel. (b) Pressure water spray.
3. Saturated hot brine peeling, followed by pressure water spray.
4. Abrasive peel only—continuous and batch type.

Potatoes of similar varietal characteristics are being peeled by all of these methods. Indicated wastes on potatoes of like quality when peeled by these verious methods ran from 16 to 38 percent. Perhaps 16 percent is low. Obviously, 38 percent is high. When regarded in the light of our need for food, such waste should not be tolerated. What is true of potatoes is true, to a similar degree, of carrots, onions, cabbage and sweet potatoes.

What can be done about it? First of all let us face the facts and admit that the overall efficiency of some one preparation method is best. Today there are advocates of at least three methods who claim theirs is superior. Neither has accumulated sufficient production data to prove it. On the other hand, there must be sufficient data available among the dehydrators of this country to prove conclusively what process and its accompanying equipment design is the most efficient. This idea of compiling data may sound radical, but it would surely solve the problem. Arguments against such a plan are many; for it, only one. Shall we labor to produce the food from the field only to waste it in the plant?

A Problem with Dicers

While on the subject of waste, we might do well to bring out another point which should concern practically all dehydrators of vegetable root crops. Reference is made to the preparation process of dicing. In most cases the equipment used for this process is of one make and design, and truly represents a piece of modern, well-engineered machinery. When properly maintained, it will operate with high capacity and minimum waste. Basically, it is designed to operate under

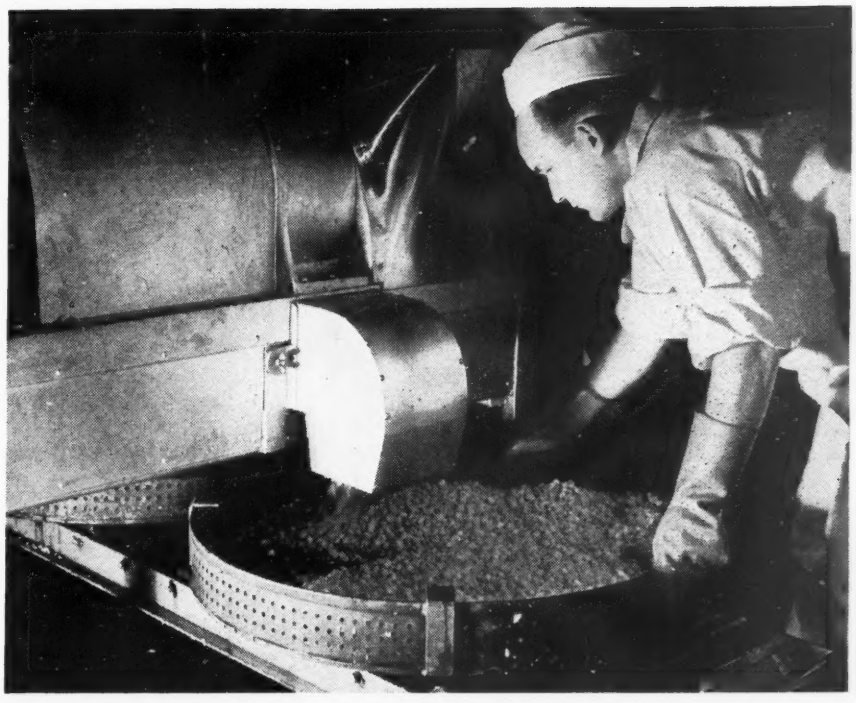
near-load capacity to produce the maximum number of perfect cubes. The manufacturer specifically points this out. Yet, in only two instances were provisions observed for controlling this operation. In many plants we have observed that operators know little more about the equipment other than the process of changing knives. With continued operation, a dicer does require adjustment and replacement of certain parts to secure maximum operating efficiency. It may seem to the casual observer that a small amount of waste in a relatively low-cost item is of no consequence. But let us consider a plant dehydrating 200,000 lb. (wet) of potatoes per day, and assume that the dicer waste is one-half of one percent above that considered normal. In a single day of operation this would amount ot 1,000 lb. Is this worth trying to save?

Better Control Needed

In the field of process control there is every indication that much improvement can be made. Perhaps the most universal point of control failure exists in the blanching treatment. There is the conviction that many cases of obvious failure to inactivate enzymes were definitely the result of an underblanch. Current knowledge indicates that enzyme activity may occur after the enzymes supposedly have been inactivated by a commercial blanch. Until such knowledge becomes specific for each of the products now being dehydrated, we feel that every effort should be made to control the blanching treatment according to definite prescribed conditions. When so done, the evidence is that the degree of enzyme inactivation has been commercially acceptable. Some of the obvious causes of inadequate blanching are these:

1. Lack of feed control on continuous blancher belts and resultant loading to the point where proper heat penetration is not secured.
2. Carryover from improperly treated boiler feed water with resultant plugging of steam distributor pipe orifices.
3. Inadequate boiler capacity with resultant pressure fluctuations and temperature variation in the blancher.
4. Sluggish control equipment, particularly the self-operating type. This difficulty is accentuated by boiler-pressure fluctuations.
5. Failure of operator to maintain adequate watch where hand-operated steam-control is used.

In many plants, routine enzyme inactivation checks are made. In others, the matter is forgotten, and likely no one knows how to make the tests anyway. "If our gracious and benevolent Uncle doesn't want the stuff, some shyster peddler does, so why be bothered," seems to be the attitude of these plant managements.



Dicing machine discharging carrots into perforated basket in which they are blanched before dehydration. Dicers require adjustment and maintenance.

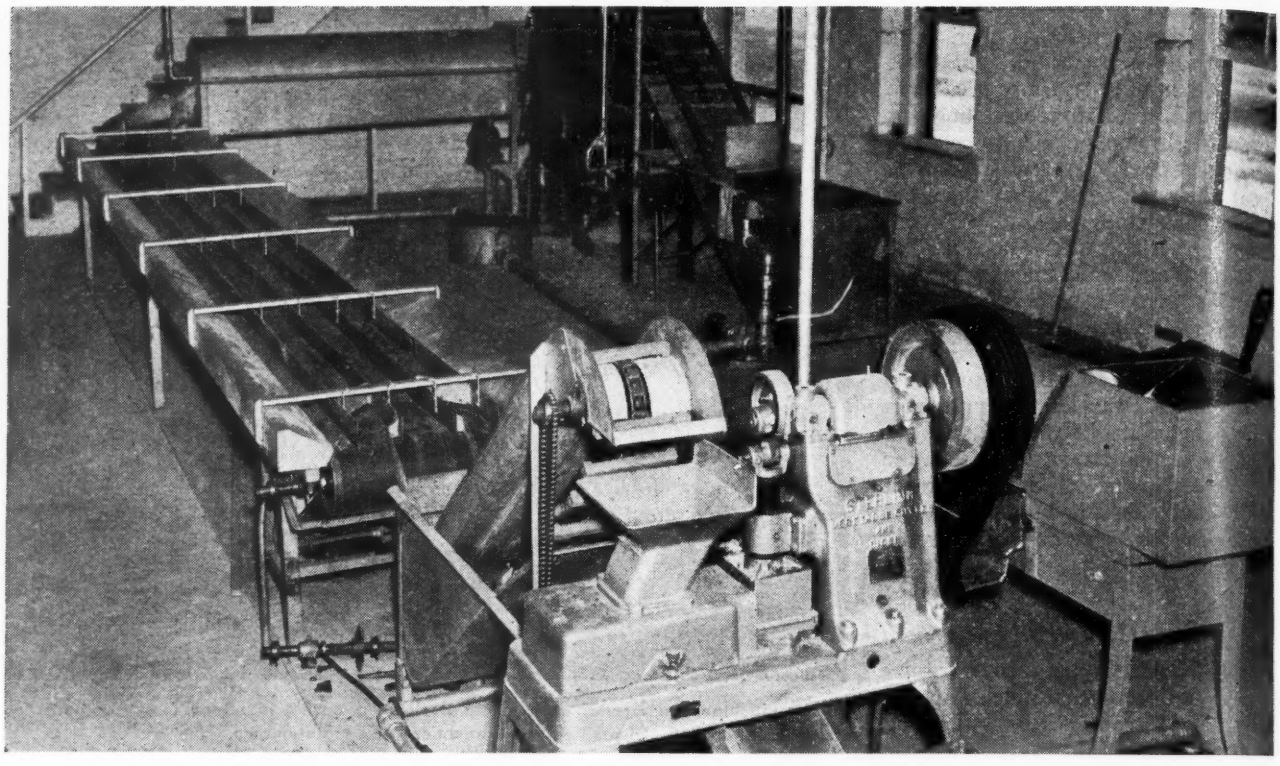
In the field of tunnel control, installations have been observed where recording thermometers depict the day's operation. Temperature control and humidity control are automatic. Moisture-test approximations are frequent and are duly recorded. Interesting and ingenious methods have been developed which give quick moisture results that are comparable with the time-consuming vacuum-oven test. We are at a loss to know why the industry as a whole hasn't availed itself of this knowledge. On the other side of the picture, there are many plants that have no tunnel control equipment outside of dry and wet bulb thermometers. And in some cases, the wet-bulb thermometer is inoperative because of failure to replenish the water supply in the wet-bulb reservoir. What does it all add up to? Simply this: The fellow who doesn't know his control problems and recognize them is missing a good bet to improve quality and produce a uniform, acceptable product which might possibly have a place in the food field when the war is over.

Various scientific workers have indicated that for most dehydrated products there exists a certain minimum moisture content which will give the best quality and greatest life expectancy. In its purchases of dehydrated foods, the government has established maximum permissible moisture contents. And in most cases this maximum is above the optimum desired. As a result of such purchasing, it is the practice in the industry to approach this maximum as nearly as possible, little thought being given to the life expectancy of the product. By way of suggestion, it might be well to retain the present maximum moisture limits, but at the same time, allow premium payments, on a scaled basis, for lower moisture contents. Another plan would be to encourage buying on a bone-dry basis.

Before leaving the matter of quality control, we wish to point out that only a few canners have seen fit to go into dehydration. Yet it is a kindred field and many of the processes are similar. Perhaps there is a good reason for this reluctance. On the other hand, we have noted that very few dehydrators have availed themselves of the opportunity to secure technically trained men from the canning industry.

A War Baby?

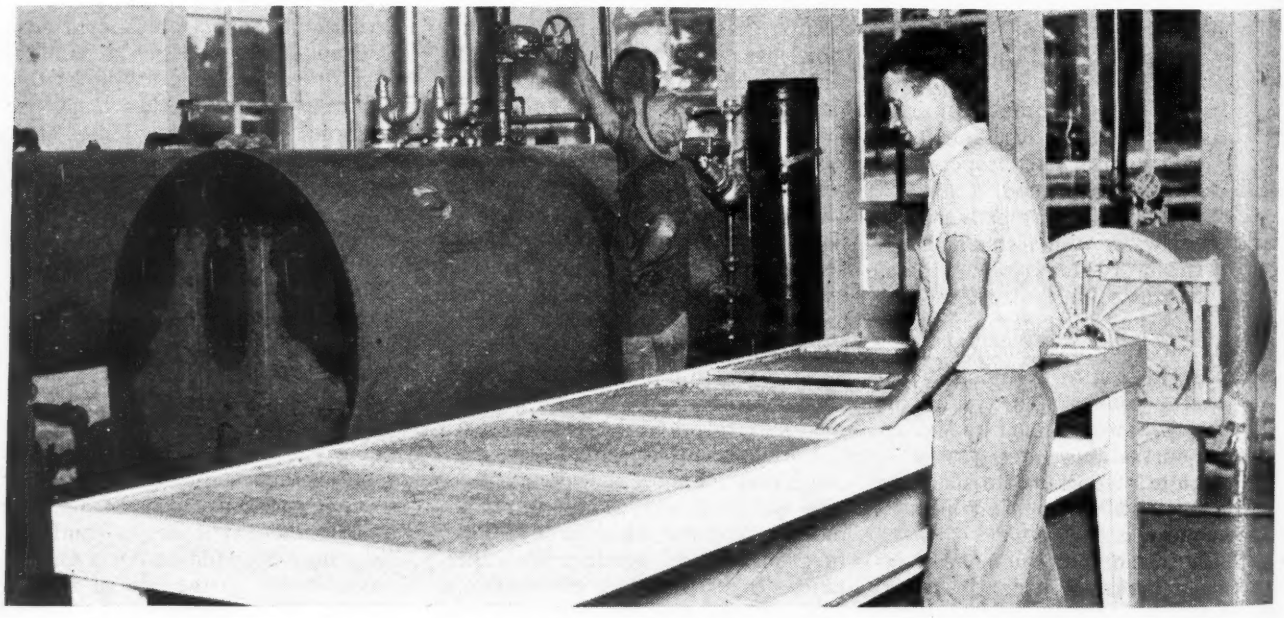
Many have asked, "Is dehydration a war baby?" Well, it can be. The reflection cast upon the industry by the few who fail to do a creditable job and keep up with new ideas in their field will determine the postwar acceptance of dehydrated food. If dehydrators will produce uniform quality food (it can be done) that can be relished after ten and more months of shipping and handling, then dehydration has a chance. If not, it will go the way of the old religious revival tent meeting. When the campaign is done and the shouting is over, it will silently fold up and fade away to await another campaign.



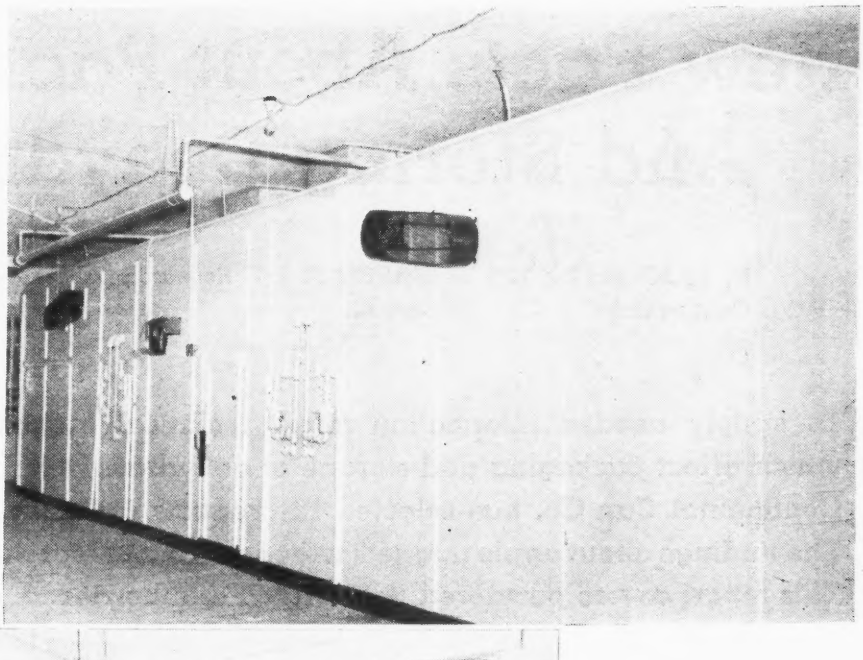
1. Sweet potatoes are first placed in the washer shown at the rear center, which after washing elevates and delivers them to a lye peeler. From the peeler, the potatoes pass through a high-pressure spray washer (shown at rear) where the skins are removed, and then to a trimming and inspection belt. From this belt, the potatoes are delivered to a second washer, which in turn feeds them into the hopper of the slicing machine. The latter machine will either slice, dice or string the potatoes.

Dehydrating Sweet Potatoes

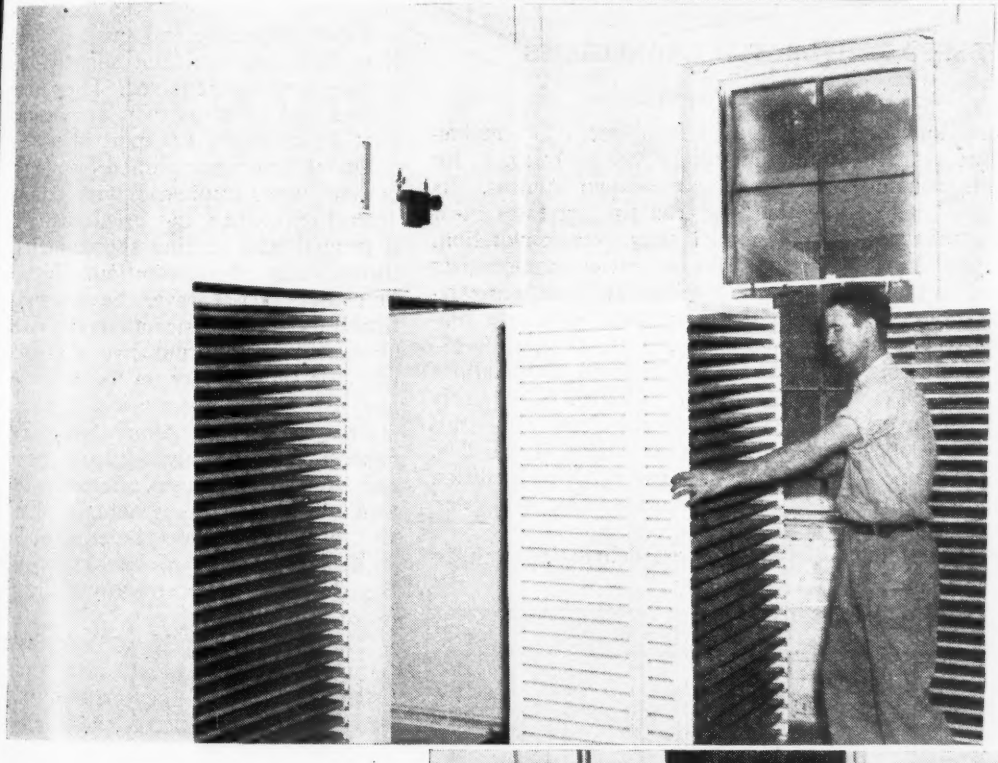
King Pharr Co., Cullman, Ala., produces 10 to 12 tons a day for Army. Designed by Cleaver-Brooks Co., plant is suitable for other vegetables



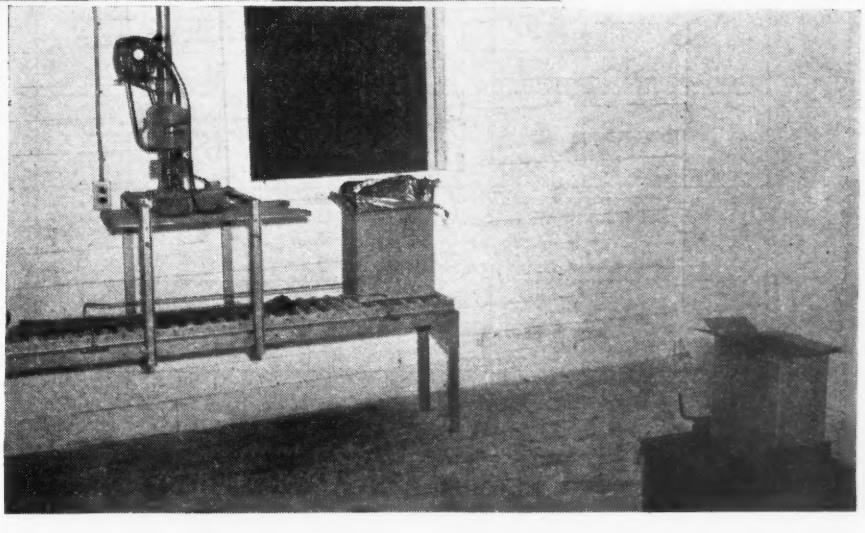
2. Sliced potatoes go from the slicer directly onto trays which are placed on the draining table shown in this picture. Here the excess water is drained off and the trays of potatoes then go to one of the two blanchers with which the plant is equipped. Next the trays of blanched potato slices are placed on trucks, ready to be wheeled into the dehydrator. Boiler is in background.



3. Dehydration at the King Pharr plant is carried out in a tunnel dehydrater 43 ft. long, 10 ft. high and 7 ft. wide. The trucks, loaded with trays of sliced potatoes, are pushed into the entrance of the dehydrater, pass through it and are removed at the other end. Dehydration is in two stages, the first at 212 deg. F. dry bulb and 110 deg. F. wet bulb. At the exit end of tunnel, the second stage dehydration is carried out with a dry-bulb temperature of 140 to 160 deg. F. Drying time is 7½ to 8 hours. Heat for the circulating air is supplied from steam coils. Heat, air flow and recirculation are controlled by Johnson controls, which are also used on the blanchers



4. At the exit end of the dehydrater, the trucks loaded with trays of sweet potato slices, from which 90 to 95 percent of the moisture has been removed, are taken from the tunnel. The finished material then passes into another room, where it is packaged. The dehydrated product is being shipped to the armed forces all over the world. In the dehydrated form the yams look like some new kind of breakfast food.



5. Dehydrated sweet potato is packed in containers measuring 12x12x6 in. (outside dimensions). These consist of a fiberboard container having an inner pouch of lead foil laminated onto kraft paper. The potato is packed on a vibratory packer or shaker, shown at the right of this picture. Next, the inner pouch is heat sealed, lead to lead. Finally, the container flaps are sealed, the heat sealing device being shown at the left.

New Facts About Packaging And Storing Dehydrated Foods

By MEMBERS OF THE RESEARCH STAFF, Research Laboratories, Continental Can Co., Chicago, Ill.

To supply needed information about technical factors which affect packaging and storage of dehydrated food, Continental Can Co. has selected 12 products for study. The findings about apple nuggets were reported in March. This report covers powdered dehydrated cranberries

PART III—POWDERED DEHYDRATED CRANBERRIES

DATA obtained from the study of cranberries through one year of storage justify the following conclusions:

1. Powdered dehydrated cranberries is a satisfactory acceptable food product and can be reconstituted to make a sauce comparable to that from the whole berries as ordinarily purchased. It is a fair to good source of ascorbic acid (vitamin C).

2. The approximate original flavor, color and jellying qualities can be successfully preserved for a period of at least 6 months, possibly 12 months, provided that the product is held in an atmosphere essentially free from oxygen and not subjected to temperatures appreciably above 80 deg. F. for more than one or two months. Its ascorbic acid content decreases most rapidly immediately after dehydration, but about 80 percent is retained after 6 months' storage at room temperature with no apparent losses on subsequent storage.

3. Storage at elevated temperatures (approximately 130 deg. F.) quickly reduces the overall quality of this product and soon makes it inedible, completely lacking in jellying qualities, and distinctly unattractive in appearance.

The powdered dehydrated cranberries for this experimental pack were supplied by Sardik Food Products Corp., Lockport, N. Y. A portion of the October 25 commercial run was taken to the New York State Agricultural Experiment Station at Geneva and packed into cans under the various conditions. The cranberries were grown on Cape Cod and consisted of both large and small berries. Both fully matured and slightly immature berries were mixed. They were cooked and dried as soon as possible after arrival at the Lockport plant.

Drying was accomplished by pumping the pulped cranberries onto a drum dryer from which the dried material is scraped after making approximately three-fourths of a revolution. By the time the material leaves the air-conditioned room which surrounds the take-off section of the drum dryer and falls into a large container on the floor below, it is at a temperature of approximately 85 deg. F. After drying, the flaked material is pulverized in a hammer mill and packaged. Between the time the material was actually dried and the time it was experimentally packed (2 days), it was held in regular No. 2½ cans under approximately 15 in. of vacuum.

The staff of the New York State Agricultural Experiment Station assisted in making the experimental pack. It was completed on October 27, 1942, and delivered to the Chicago laboratories on October 29. Only 211x414 cans were packed at Geneva, but a sufficient number of them, hermetically sealed in air, was included so that samples of the new Army 3-in-1 container could be packed at the Continental Can Co. Laboratories. The inner bags were not available until December 1. As a result, this pack was completed and the storage studies were begun at that time.

Immediately after packing at Geneva on October 27, three nitrogen-packed and three CO_2-packed cans, surrounded with solid CO_2 (dry ice) in a carton, were shipped to the laboratory for initial examination. The oxygen content of these cans and the pH, moisture content and flavor of

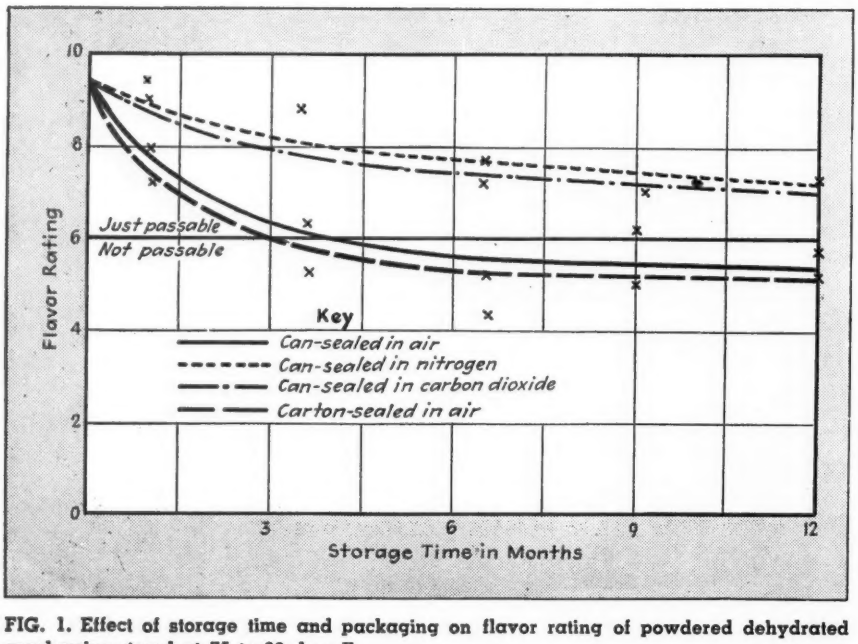


FIG. 1. Effect of storage time and packaging on flavor rating of powdered dehydrated cranberries stored at 75 to 80 deg. F.

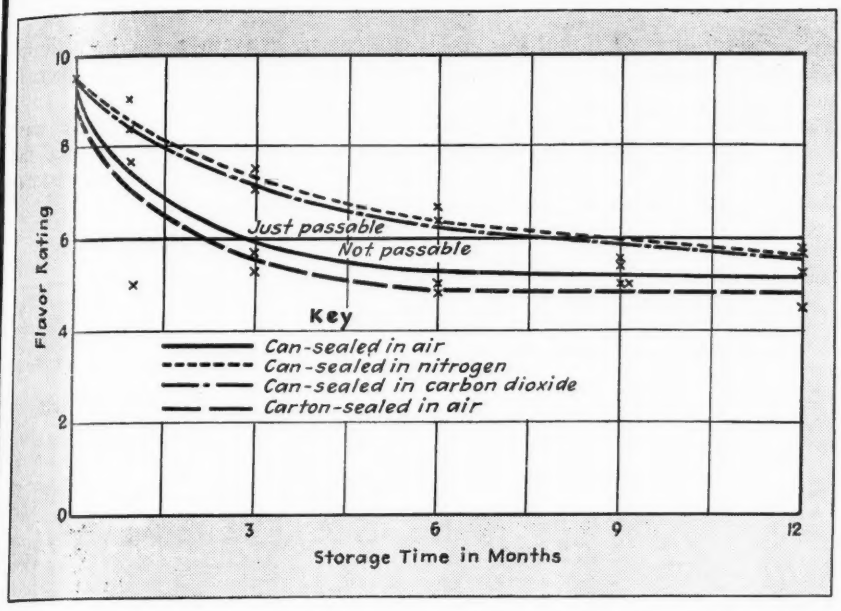


FIG. 2. Effect of storage time and packaging on flavor rating of powdered dehydrated cranberries stored at 98 deg. F.

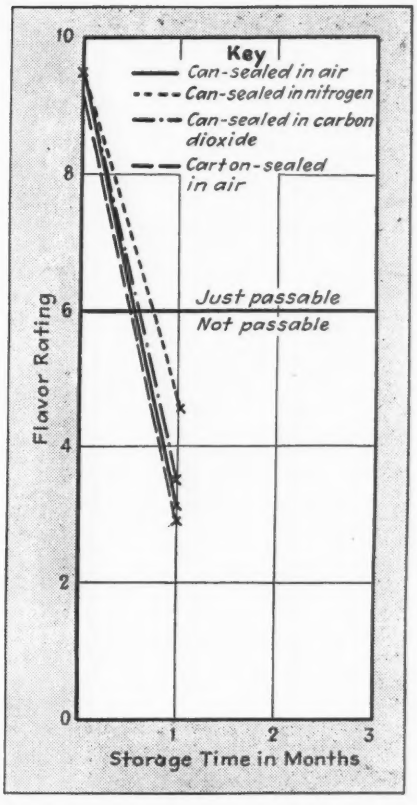


FIG. 3. Effect of storage time and packaging on flavor rating of powdered dehydrated cranberries stored at 130 deg. F.

the product were determined upon receipt of these cans in the Chicago laboratory.

The following modifications to the regular examination procedure were made in the course of this experiment:

1. Color: The Munsell disks required to match adequately the color of the dehydrated powdered cranberries were not available until after two months of the storage period was completed. Consequently, the data on color are only complete from that time. All color ratings refer to the dry product.

2. Reconstitution: All the flavor tests, pH determinations and jellying tests were made on cranberry sauce prepared according to the following formula:

10 grams of cranberry powder
85 grams of sugar
130 c.c. of water

pH determinations were made with the aid of a glass electrode on the cranberry sauce after it had cooled, but before jellying.

3. The initial vitamin assay was not made until 2½ weeks after the product was received in the Chicago laboratory because of difficulty with the method of determination. During this time the product was held under nitrogen at 30 to 32 deg. F.

Ascorbic acid content was determined by a modification of the Morell method in which, after a 15-second reaction, the excess dye is extracted with xylene and the concentration of dye is read on a spectrophotometer. Revision of the standard procedure was necessary since the natural red pigment in the cranberries interferes

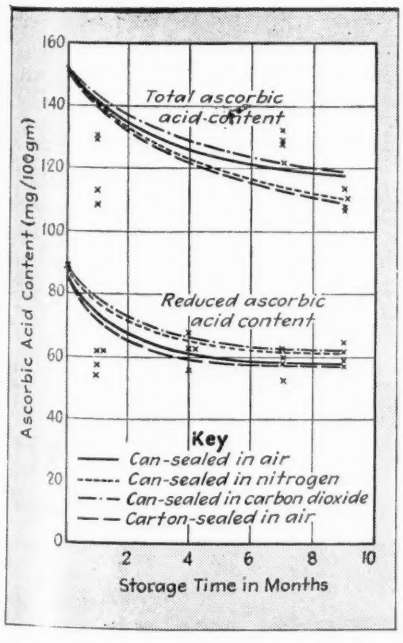


FIG. 4. Effect of storage time and packaging on total and reduced ascorbic acid content of powdered dehydrated cranberries stored at 75 to 80 deg. F.

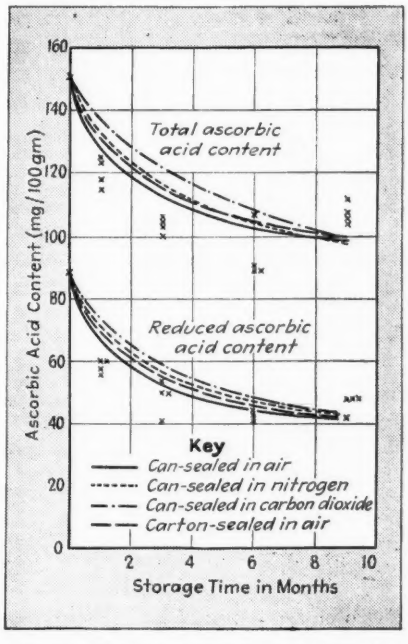


FIG. 5. Effect of storage time and packaging on total and reduced ascorbic acid content of powdered dehydrated cranberries stored at 98 deg. F.

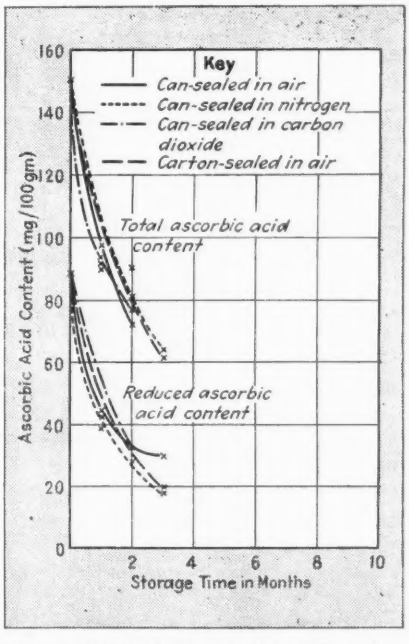


FIG. 6. Effect of storage time and packaging on total and reduced ascorbic acid content of powdered dehydrated cranberries stored at 130 deg. F.

with the regular photometric readings. Both the reduced and the total ascorbic acid contents were determined, with the dehydroascorbic acid being calculated by difference.

4. Because the product stored at 130 deg. F. deteriorated so rapidly, examinations of these samples were discontinued after three months' storage.

Summary of Results

A. Effect of Packaging—The gas-packed product was definitely better with respect to flavor than that sealed in air. The samples not gas-packed soon developed an off-flavor, even when stored at room temperature.

As far as color and ascorbic acid content are concerned, there was little difference between the samples packed in the various containers.

A small amount of moisture was picked up by the product packed in the paper containers. This moisture resulted in greater caking.

(*Turn to page 135*)

TABLE I—Results of Examinations of Powdered Dehydrated Cranberries

Storage at 75 to 80 deg. F (room temperature)

Storage time	Package	Flavor rating	Color (dry product) %N1 black	%5R4/14 red	%4RH/16 bright red	Jellying	Vitamin content Ascorbic acid (mg./100 gm.) Reduced	Total	Gas analyses %O_2	%CO_2	pH
Moisture content of product — 2.0 percent											
Initial examination	Can—N_2	9.5	..	..	..	Excellent	89	151	0.6	0.3	2.6
	Can—CO_2	9.5	..	..	..	Excellent	..	...	0.6	97.1	2.6
1 month	Can—air	8.0	..	..	..	Excellent	54	113	....	....	...
	Can—N_2	9.0	..	..	..	Excellent	62	129	0.8	0.9	...
	Can—CO_2	9.5	..	..	..	Excellent	62	130	1.1	94.6	...
	Carton	7.2	..	..	..	Excellent	58	109	....	....	...
4 months	Can—air	5.4	57	..	43	Good	56	129	....	....	2.4
	Can—N_2	8.4	57	..	43	Poor	68	127	....	....	2.4
	Can—CO_2	8.7	63	..	36	Poor	63	133	....	....	2.4
	Carton	6.4	58	..	42	Good	63	125	....	....	2.3
7 months	Can—air	4.4	63	..	37	Good	58	127	17.6	1.2	...
	Can—N_2	7.7	63	..	37	Good	63	128	0.2	0.6	...
	Can—CO_2	7.2	63	..	37	Good	60	132	0.8	94.8	...
	Carton	5.2	63	..	37	Good	53	122	....	....	...
9 months	Can—air	6.2	61	2	37	Good	59	114	16.0	2.8	2.4
	Can—N_2	7.2	65	3	32	Fair	62	107	0.2	1.2	2.4
	Can—CO_2	7.2	65	..	35	Fair	65	110	0.4	96.9	2.4
	Carton	5.1	66	3	31	Fair	58	108	....	....	2.4
12 months	Can—air	5.8	59	7	34	Fair	91*	149*	12.0	4.2	...
	Can—N_2	7.5	54	7	39	Fair	85*	195*	0.4	1.2	...
	Can—CO_2	7.2	52	7	41	Fair	84*	156*	0.4	95.5	...
	Carton	5.4	55	7	38	Fair	76*	120*	....	....	...

*These high values have been checked on duplicate samples and are apparently due to reducing materials developed on storage.

TABLE II—Results of Examinations of Powdered Dehydrated Cranberries

Storage at 98 deg. F.

Storage time	Package	Flavor rating	Color (dry product) %N1 black	%5R4/14 red	%4R4/16 bright red	%N-9.5 white	Jellying	Vitamin content Ascorbic acid (mg./100 gm.) Reduced	Total	Gas analyses %O_2	%CO_2	pH
Moisture content of product—2.0 percent												
Initial examination	Can—N_2	9.5	..	..	..	..	Excellent	89	151	0.6	0.3	2.6
	Can—CO_2	9.5	..	..	..	..	Excellent	..	...	0.6	97.1	2.6
1 month	Can—air	5.0	..	..	..	..	Fair	58	115	....	....	...
	Can—N_2	9.0	..	..	..	..	Good	60	123	....	....	...
	Can—CO_2	8.3	..	..	..	..	Good	56	124	....	....	...
	Carton	6.6	..	..	..	..	Fair	60	118	....	....	...
3 months	Can—air	5.7	71	..	28	..	Did not jelly	41	105	13.4	5.6	2.5
	Can—N_2	7.5	67	..	32	..	Did not jelly	50	106	0.0	2.3	2.5
	Can—CO_2	7.0	72	..	28	..	Did not jelly	53	100	0.4	95.5	2.5
	Carton	5.3	68	..	31	..	Did not jelly	50	104	....	....	...
6 months	Can—air	4.8	83	..	17	..	Did not jelly	41	91	10.0	9.6	...
	Can—N_2	6.7	84	..	16	..	Did not jelly	43	90	0.0	4.2	...
	Can—CO_2	6.4	83	..	17	..	Did not jelly	44	107	0.4	94.8	...
	Carton	5.0	86	..	14	..	Did not jelly	42	90	....	....	...
9 months	Can—air	5.0	76	4	19	1	Did not jelly	48	108	9.2	10.1	2.4
	Can—N_2	5.4	76	9	13	1	Did not jelly	48	106	0.0	6.0	2.4
	Can—CO_2	5.5	78	4	17	..	Did not jelly	48	104	0.3	98.6	2.4
	Carton	5.0	82	8	9	..	Did not jelly	43	112	....	....	...
12 months	Can—air	5.3	87	5	8	..	Did not jelly	83*	244*	5.0	11.8	...
	Can—N_2	5.8	85	6	9	..	Did not jelly	99*	191*	0.0	6.3	...
	Can—CO_2	5.7	85	6	9	..	Did not jelly	89*	192*	0.0	96.0	...
	Carton	4.5	91	6	3	..	Did not jelly	129*	224*	....	....	...

*These high values have been checked on duplicate samples and are apparently due to reducing materials developed on storage.

TABLE III—Results of Examinations of Powdered Dehydrated Cranberries

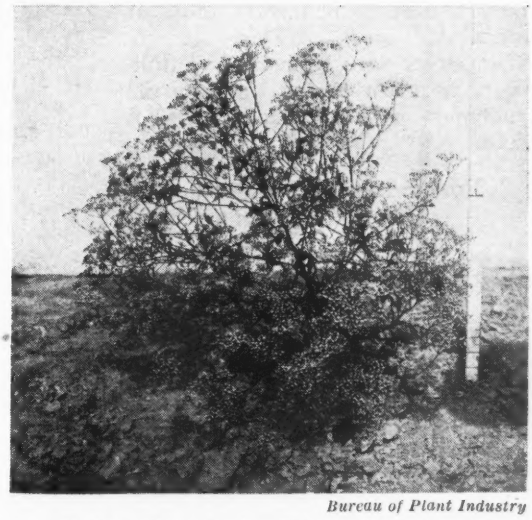
Storage at 130 deg. F

Storage time	Package	Flavor rating	Color (dry product) %N1 black	%4R4/16 bright red	%N-9.5 white	Jellying	Vitamin content Ascorbic acid (mg./100 gm.) Reduced	Total	Gas analyses %O_2	%CO_2	pH
Moisture content of product—2.0 percent											
Initial examination	Can—N_2	9.5	..	..	..	Excellent	89	151	0.6	0.3	2.6
	Can—CO_2	9.5	..	..	..	Excellent	..	...	0.6	97.1	2.6
1 month	Can—air	3.1	..	..	..	Did not jelly	44	98	...	....	...
	Can—N_2	4.5	..	..	..	Did not jelly	39	90	...	....	...
	Can—CO_2	3.4	..	..	..	Did not jelly	49	94	...	....	...
	Carton	2.9	..	..	..	Did not jelly	42	96	...	....	...
2 months	Can—air	Inedible	..	..	..	Did not jelly	41	68	1.1	18.4	...
	Can—N_2	Inedible	..	..	..	Did not jelly	24	86	0.0	9.8	...
	Can—CO_2	Inedible	..	..	..	Did not jelly	40	90	0.0	99.0	...
	Carton	Inedible	..	..	..	Did not jelly	35	81	...	....	...
2 months	Can—air	Inedible	..	..	..	Did not jelly	29	72	0.3	24.4	2.5
	Can—N_2	Inedible	..	..	..	Did not jelly	28	81	0.1	13.6	2.5
	Can—CO_2	Inedible	..	..	..	Did not jelly	32	77	0.2	97.9	2.5
	Carton	Inedible	..	..	..	Did not jelly	30	78	...	....	2.5
3 months	Can—air	Inedible	94	5	..	Did not jelly	..	..	0.1	29.4	2.5
	Can—N_2	Inedible	94	5	..	Did not jelly	18	64	0.1	18.0	2.5
	Can—CO_2	Inedible	94	5	..	Did not jelly	..	..	0.1	95.5	2.5
	Carton	Inedible	94	5	..	Did not jelly	19	61	...	....	2.5

Production and Characteristics Of Oil of Anise

By **ERNEST GUENTHER**, Chief Research Chemist, Fritzsche Brothers, Inc., New York, N. Y.

Anise seed is now grown experimentally in the United States to replace the imported product. This article describes its cultivation, as well as the distillation of the oil and its characteristics and applications



Bureau of Plant Industry

Typical plant of anise (Pimpinella anisum L.)

THERE are two plants, entirely different botanically, the fruits of which contain volatile oils of similar chemical composition and, therefore, of similar odor and flavor. In a previous paper,[1] the writer described his personal survey of the distillation of star anise oil from *Illicium verum* Hooker f. (fam. *Magnoliaceae*) by natives in Tonkin (French Indo-China) and in the adjacent province of Kwangsi (Southern China). Before the outbreak of the present war, large quantities of star anise oil were imported into the United States for flavoring and medicinal purposes and for the extraction of anethol, the main constituent of that oil.

A similar oil, but one possessing a much finer and more delicate flavor, is that contained in the dried fruit of anise, *Pimpinella anisum* L. (fam. *Umbelliferae*) which we shall describe in the following pages.

The Raw Material

Description — Anise, *Pimpinella anisum* L. (fam. *Umbelliferae*), is an annual herb, growing about one foot high under cultivation. The greenish-gray, dried, ripe fruit, commercially called seed, tapers to a point and varies in length from 2 to 5 mm.; it consists of two united mericarps. Anise seed is a popular flavoring agent, widely employed in baked goods, confectionery and liqueurs. Some of the best known French alcoholic beverages and *aperitifs* owe their flavor chiefly to anise seed. The volatile oil can be obtained from the fruit (seed) by steam distillation. In many instances, the oil has replaced the seed because it is liquid and has the further advantages of greater uniformity, better solubility and easier application. The oil is, furthermore, employed medicinally and for the flavoring of semi-pharmaceuticals such as tooth pastes and mouth washes.

Range and Habitat—*Pimpinella anisum* L., very likely a native of the Near East and Egypt, is widely cultivated in the warmer climates of Europe—namely in Southern Russia, Spain, Bulgaria, France, Germany and Italy—and also in Macedonia, Syria, Tunis, India, China and Mexico. This plant is being grown to a limited extent and experimented with in various parts of the United States.[2] According to origin, the seed differs somewhat in appearance and volatile oil content; Spanish anise, for instance, is smaller than the German or French, while Russian seed is very short. A difference in oil yield is caused also by adulteration of the seed with spurious seed or foreign matter such as earth, sand, dirt, and so forth.

Since the vegetation period of anise is long (130 to 140 days), it must be sown earlier than other plants; for the same reason anise requires a rather warm climate. According to Stockberger,[3] it has been found difficult to mature the crop in northerly locations, where the growing season is short, or in the South, where the climate is hot and dry. Crooks and Sievers [4] claim that there should be a frost-free season of at least 120 days from planting to harvest time. Uniform rainfall during the growing season is essential. Anise is very susceptible to sudden extreme climatic changes from wet to dry periods. The temperature should be fairly uniform throughout the growing season without excessive hot periods, especially after rainfall. Alternate rainy and dry periods when the seed is near maturity cause it to turn brown, thus greatly impairing the quality.

TABLE I—Yields Obtained from Seeds of Various Origins

Origin of the Seed	Yield of Oil (percent)
Bulgaria	2.4
Chile	1.9 to 2.6
Italy (Bologna)	3.5
Italy (Puglia)	2.7 to 3.0
Asia Minor	2.75
Macedonia	2.2
Moravia	2.4 to 3.2
Mexico	1.9 to 2.1
Eastern Prussia	2.4
Russia	2.2 to 3.2
Spain	3.0
Syria	1.5 to 6.0
Thuringia	2.4

Soil—A light, well-drained, fertile or moderately rich, sandy loam is desirable for good growth of anise. The physical nature of the soil should be such that it lends itself well to pulverizing, yet retains moisture; then the small seed can be planted at a uniform depth and cultivation of the small, young seedlings is feasible.

Planting and Cultivating—According to Stockberger,[3] anise is grown from seed sown usually early in spring directly in the field, since the seedlings are unfavorably affected by transplanting. The seeds, which should not be more than two years old, are sown thickly, about two to the inch, and covered ½ in. deep. As the plants develop very slowly, seed should not be sown in weedy soil. When 2 to 3 in. high, the seedlings are thinned to stand 6 in. apart in the row. The rows may be 18 in. to 3 ft. apart, depending on the cultivation intended. An ounce of seed should sow a row 150 ft. long; about 5 lb. will plant an acre when the rows are 3 ft. apart. The plants must receive frequent and thorough cultivation throughout the growing season.

Crooks and Sievers [4] recommend planting the seed directly in the field in rows ranging from 18 to 30 in. apart, at the rate of about one to two seeds per inch. At this rate, approximately 5 to 10 lb. of seed would be

required to plant one acre. In some European countries, seed has been broadcast, but then weeds present a major difficulty in the harvest and are likely to affect the market value of either seed or oil. When planting broadcast or with a small grain drill, where no cultivation is possible, the land must be fallowed and cleared of weeds.

Harvesting and Preparing For the Market

The same authors[4] report that in most anise producing countries the plants are pulled and stacked in the field to dry. In some cases the tops are cut off by hand, tied in bundles, and then stacked in a conical pile with the fruiting heads toward the center so that the seed continues to mature. The harvesting of anise presents quite a problem, due to progressive ripening of the umbels as well as the uneven ripening of seed within each umbel. As a rule, the plant is either pulled or cut when all the seeds of the umbel are still green; then they may continue to mature after the bundles have been shocked with seed ends toward the center. In this way a considerable amount of the seed continues to ripen while those seeds that are mature do not discolor and shatter from the plant. In foreign countries, threshing is accomplished usually by hand flailing, but there is no reason why this cannot be done by machine.

Stockberger[3] says that the plants will blossom about three months after planting, and a month later the seed should be sufficiently mature for harvesting. As soon as the tips of the seeds turn a grayish-green color, they should be harvested; left exposed to the weather, they quickly turn brown or black. The plants may be pulled by hand and piled, tops inward, in stacks about 6 ft. high, or they may be mowed and at once built up into cocks of the same height. After four or five days, the seed will have ripened; then it should be threshed out, thoroughly cleaned and bagged for the market.

Yield—Under favorable conditions, a yield of 400 to 600 lb. per acre may be expected.

Consideration of Domestic Production

Regarding the advisability of growing anise in our country, Crooks and Sievers[4] draw interesting conclusions, some of which apply not only to anise but to condiment plants in general. These authors believe that the Central and Eastern states offer possibilities for anise production. Certain parts of California and Western irrigated sections could probably be utilized, provided the amount of irrigation water is constant and the temperatures not too high during the growing and maturing season.

Certain factors favor domestic production:

1. About 25,000 acres would be required to supply United States demands. This means an acreage sufficiently large for a worth-while crop.
2. At present high market prices the gross returns per acre would be attractive indeed; and even in more normal times the returns would still hold promise of a small cash income.
3. Anise seed being an annual crop, returns on the investment can be anticipated at the end of the first growing season.
4. In regions with proper climatic conditions, it is quite possible that the plants could be harvested with either a mower or a binder; thus no special machinery would be needed.
5. Adequate distillation facilities are available in our domestic essential oil industry to process the dried seed into oil.

On the other hand, there are also features which tend to limit domestic production:

1. Proper climatic conditions, uniform in amount of moisture and suitable during the harvest period, must be found.
2. It is quite likely that after the present emergency the seed will again be imported from former sources of supply, scattered over many countries which possess an abundance of cheap labor.
3. Our trade has become accustomed to the foreign product and might accept the domestic supply only while the former is unavailable.
4. There is apt to be a shortage of seed for planting stock in this country.
5. No special varieties have been developed yet for any particular region, and it is possible that seed from different parts of Europe might vary greatly and not be adapted to regions where it is planted.
6. Anise being a relatively new crop in the United States, little is known as yet about the diseases to which it might be susceptible.

Distillation

Anise seed must be crushed before distillation, and then processed immediately to prevent any evaporation of essential oil. According to Gildemeister and Hoffmann,[5] the yields listed in Table I were obtained from seeds of various origin.

As mentioned before, origin is not wholly responsible for these differences in yield; they may be caused also by adulteration of the seed or by impurities (such as spurious seed, earth and sand) admixed in the seed.

Physical and Chemical Properties Of Anise Seed Oil

If solid material has separated, the oil must be warmed carefully at low temperature until completely liquefied; it must be thoroughly mixed before using. At a temperature above 20 deg. C., anise oil is a colorless, strongly refractive liquid of characteristic, peculiar odor and very sweet taste. According to Gildemeister and Hoffmann,[5] the oil congeals in the cold to a snow-white crystalline mass which begins to melt at 15 deg. C. or higher, and completely liquefies at 18 or 20 deg. C.

"Under certain conditions, the oil can be cooled considerably below this congealing point without solidifying and can remain for a long time in this condition. However, the presence of a particle of dust, contact with an anethol crystal, a violent disturbance, or scratching of the inner surface of the vessel with a glass rod, causes sudden crystallization with an appreciable rise in temperature of the entire mass. The highest point on a thermometer, immersed in the crystallizing mass, is known as the congealing point. Inasmuch as it depends on the anethol content of the oil, this congealing point is a valuable criterion in evaluating the oil. It lies between 15 and 19 deg. C., in the case of good oils not below 18 deg. C."

Regarding the technic for determining the congealing point, the United States Pharmacopoeia, Twelfth Revision, gives exact instructions on page 566. According to Gildemeister and Hoffmann,[5] the other constants of anise oil vary between the following limits:

Specific gravity at 20 deg. C.	0.980 to 0.990
Optical rotation	Slightly laevo rotating, up to 1 deg. 50 min.
Refractive index at 20 deg. C.	1.552 to 1.559
Solubility	Soluble in 1.5 to 3 volumes of 90 percent alcohol

When exposed for long periods to the action of light or air, anise oil, espe-

TABLE II—Effect of Air and Light on Anethol

	Original anethol	Exposed to light and air	Exposed to air
D 25 deg.	0.986	1.114	1.080
Solubility	1.5 to 2 volumes and more of 90 percent alcohol.	Miscible with 80 percent alcohol. The solution has a decided blue fluorescence	0.5 volumes 80 percent alcohol and more. The solution has a blue fluorescense
Acid value		1.4	1.4
Aldehyde content as anisic aldehyde	0.7 percent	25.0 percent	17.6 percent
Flavor	Sweet, anethollike	Very harsh and bitter	Harsh and bitter

Note: The experiment and the control were permitted to stand undisturbed for 18 months.

National Farm Chemurgic Council

Field of anise growing near Boise.

cially in liquid form, slowly loses its capacity to crystallize until finally it will no longer congeal. The specific gravity is thereby increased, in some cases to above 1.0, the refractive index reduced, and at the same time the oil becomes more readily soluble in 90 percent alcohol.

In order to determine whether or not the solubility of anethol-containing oils actually improves with age, a series of experiments have been carried out in our New York laboratories. A sample of anethol was permitted to stand in an uncorked, half-filled Flint bottle exposed to both air and light. To determine the effect of light, a control was also run, this control being kept in the dark room. The analysis of the anethol before the experiment, of that used in the experiment and of the control are given in Table II.

The increase in solubility can best be explained by the conversion of anethol into anisic aldehyde by atmospheric oxidation (anisic aldehyde is soluble in 7 volumes of 50 percent alcohol and has a gravity of 1.130 at 15.0 deg.). The blue fluorescence in the alcoholic solutions might possibly be due to di-p-methoxy stilbene. It is to be noted that oxidation occurs even in the absence of light and, as is to be expected, light apparently hastens this oxidation process.

Adulteration

Anise oil is frequently adulterated with the lower priced star anise oil which, according to the United States Pharmacopoeia, is also considered "anise oil." Yet, strictly from the point of view of flavoring, anise oil (*Pimpinella anisum*) is undoubtedly superior to star anise oil (*Illicium verum*), the latter having a somewhat harsher and hence less desirable odor.

Other adulterants are synthetic anethol (made from pine oil) and fennel oil. The presence of the latter can be detected by the change in optical rotation, fennel oil being dextro-rotatory.

Chemical Composition

The chemistry of anise oil is rather simple, the oil consisting mainly of two isomeric compounds of the empirical molecular formula $C_{10}H_{12}O$, namely anethol and methyl chavicol. They were identified by the Schimmel chemists [6] and by Bouchardat and Tardy:[7]

anethol.....	Eighty to 90 percent of oil consists of this phenolic ether which is solid at room temperature. Anethol is white, crystalline, of intensely sweet anise-like odor and flavor. At 22.5 deg. C. it melts to a colorless, optically inactive, strongly refractive liquid of pure anise odor and very sweet taste. Under the influence of light and air, or heat, anethol loses its ability to crystallize, assuming simultaneously a viscous consistency, a yellow color, and a bitter, disagreeable taste which is no longer characteristic of anise. This is accompanied by an increase in the specific gravity, sometimes above 1, a lowering of the refractive index, and a better solubility in dilute alcohol. According to de Varda,[8] the change is caused by polymerization of anethol to photoanethol; according to Hoening and Graelert, by oxidation to anisic aldehyde[9], anisic acid and other products, among them di-p-methoxy stilbene. The last named compound is quite insoluble, and, therefore, freshly prepared anethol, upon standing, sometimes becomes turbid. It is quite possible that di-p-methoxy stilbene is not formed directly from anethol but from anisic aldehyde as intermediary product of reaction. (See in this connection also our own observations, as stated in the section "Physical and Chemical Properties.")
methyl chavicol....	It has a slight anise-like odor, but not the sweet flavor of anethol. Methyl chavicol is liquid at room temperature and, like anethol, optically inactive.
anisic ketone (p-methoxy-phenyl-acetone)	Bouchardat and Tardy[10] and later Tardy[11] found in anise oil a ketone, the odor of which is somewhat reminiscent of bitter almond oil; they named it anisic ketone. Its formula and properties correspond to those of p-methoxy-phenyl acetone as obtained by Behal and Tiffeneau.[12]
acetaldehyde.....	In the first run.
terpenes (?).....	In very small quantities. It has been suggested that their presence in the oil is caused by impurities in the anise seed material.

Application

We have already mentioned the wide employment of anise oil in the flavoring of culinary preparations, beverages, confectionery, pharmaceuticals and semi-pharmaceuticals.

Medicinally, the oil is useful to stimulate peristalsis in cases of colic.

References

1. E. Guenther, Oil of Star Anise, *The American Perfumer*, September and October, 1940.
2. Willkie and Kolachov, The Domestic Production of Essential Oils from Aromatic Plants, National Farm Chemurgic *Bulletin*, Columbus, Ohio, 1940.
3. Drug Plants under Cultivation, U. S. Department of Agriculture, Farmers' *Bulletin* No. 663.
4. Condiment Plants, U. S. Department of Agriculture, Bureau of Plant Industry, July, 1941.
5. "Die Aetherischen Oele," 3rd edition, Vol. III, p. 502.
6. *Bericht der Schimmel & Co.*, October, 1895, p. 6.
7. *Comptes rendus*, No. 122, 1896, p. 624.
8. *Gazzetta chimica Italiana*, No. 21, 1891, I, p. 183.
9. *Berichte der deutschen chemischen Gesellschaft*, No. 42, 1909, p. 1204.
10. *Comptes rendus*, No. 122, 1896, p. 198 —*Bulletin de la societe chimique*, III, No. 15, 1896, p. 612.
11. Thesis, University of Paris, 1902. p. 11.
12. *Bulletin de la societe chimique*, III, No. 25, 1901, p. 275.

Simple Separator Speeds Grading

Peas and other vegetables can be graded for maturity faster and more accurately with new device which anyone can make from scrap material

By E. L. BIRDSALL, The Kroger Food Foundation, Cincinnati, Ohio

GREATER speed and accuracy in grading peas and certain other vegetables for maturity can be attained with the new pea separator to be used in conjunction with the brine flotation test. A simple device, it eliminates the personal equation involved in other maturity-measuring methods and at the same time conforms to the grading requirements of the Food Distribution Administration.

In grading peas for quality, the maturity score is the most important of all factors, and it usually determines the final grade of the peas. Of all the different methods of maturity determinations, the salt brine flotation is the quickest and most practicable.

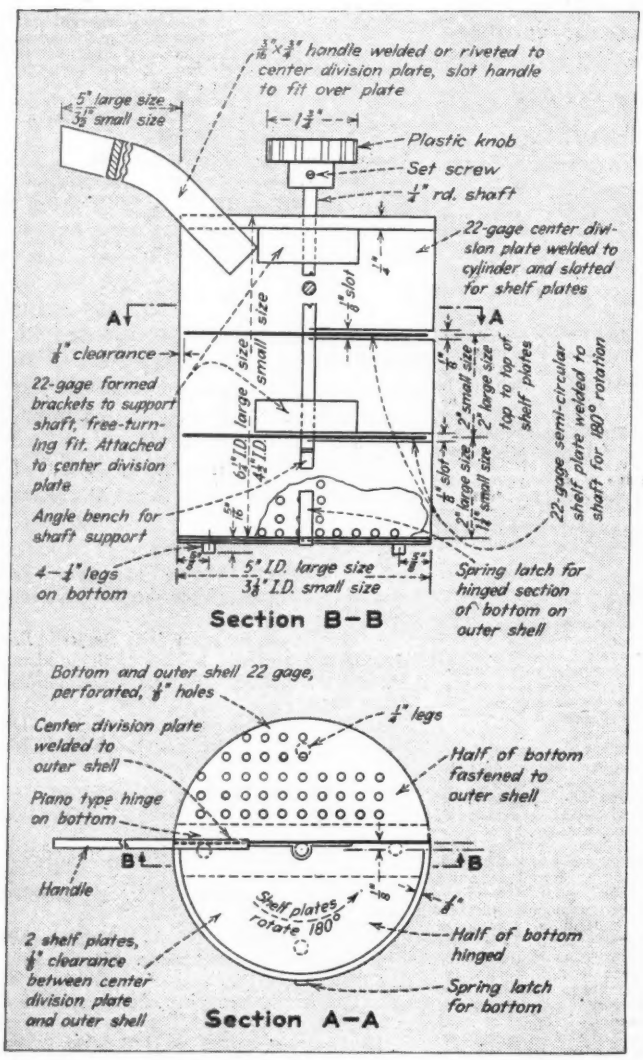

3/16"×3/4" handle welded or riveted to center division plate, slot handle to fit over plate
5" large size
3 3/8" small size
1 3/4"
Plastic knob
Set screw
1/4" rd. shaft
22-gage center division plate welded to cylinder and slotted for shelf plates
1/8" slot
A
A
1/8" clearance
22-gage formed brackets to support shaft, free-turning fit. Attached to center division plate
large size
small size
6 1/2" I.D.
4 1/4" I.D.
Angle bench for shaft support
4—1/4" legs on bottom
5" I.D. large size
3 3/8" I.D. small size
1" small size
2" large size
top to top of shelf plates
22-gage semi-circular shelf plate welded to shaft for 180° rotation
Spring latch for hinged section of bottom on outer shell
Section B—B
Bottom and outer shell 22 gage, perforated, 1/8" holes
1/4" legs
Center division plate welded to outer shell
Half of bottom fastened to outer shell
Piano type hinge on bottom
B
B
Handle
Shelf plates rotate 180°
1/8"
Half of bottom hinged
2 shelf plates, 1/8" clearance between center division plate and outer shell
Spring latch for bottom
Section A—A

FIG. 1. With this drawing you can construct the pea separator. There are dimensions for large and small models. The larger is used with a battery jar (7¾ in. high, 6 in. in diameter). The smaller fits a 600-ml. beaker (4½ in. high, 3¼ in. in diameter).

Eight different salt brines, ranging from 10 to 16 deg. sal., are listed in Federal grades for peas, these to be used in determining the degree of maturity and the corresponding maturity rating. The rating is ascertained by calculating the percentage of peas that sink and the percentage that float in the different solutions.

The distinction between sinkers and floaters is made after the peas have been immersed in a 2-in. column of a given brine solution for 10 seconds. The peas that sink more than 2 in. during 10 seconds are "sinkers"; all others are "floaters."

The usual procedure is to place a given brine solution in a beaker, to a depth of 2 in. From 10 to 50 peas are counted and immersed in the brine. Ten seconds after the peas are immersed, the peas on the bottom of the beaker are counted and the percentage of sinkers computed.

There are several disadvantages to this technic. Because of osmotic action, all peas eventually become sinkers. Contact with the salt solution increases their specific gravity, so that in many instances the floaters become sinkers even before the true sinkers can be counted. Furthermore, in borderline cases the peas sink continuously so that 10-second sinkers cannot be distinguished from the 10-second-plus sinkers, although the latter must be classified as floaters. There are two other disadvantages: (1) Before each test, exactly 2 in. of brine must be measured accurately into a glass dish. (2) At the end of each test, all the peas must be removed by pouring the solution and peas through a sieve.

New Method More Accurate

In use in our laboratories for some time, a pea separator of our design and construction eliminates the disadvantages of the old method and increases the speed and accuracy of determining the maturity of peas by the flotation method. The peas merely are placed in a pea separator and the separator immersed in the brine solution. A knob is turned to release the peas, and after 10 seconds the knob again is turned to trap the floaters and sinkers in separate compartments. The sinkers can be removed readily and counted in a very few seconds.

This method is accurate, since the trapping occurs at the termination of the 10-second interval and no confusion can exist as to which peas are sinkers and which are floaters. It is no longer necessary to strain off the peas after each test, as all peas are in the separator and can be removed merely by opening a hinged bottom. Nor is it necessary to measure exactly 2 in. of brine in a dish, since the separator accomplishes this function automatically. Then, too, a large container of brine can be used. Dilution of the brine caused by the moisture adhering to the peas is less rapid with a large quantity, and the density of the solution need not be checked as frequently.

The design of the separator is simple, and it can be constructed easily from scrap materials. But all materials must be noncorrosive since the separator is immersed in brine.

How It Is Made

The pea separator shown in Fig. 2 was designed to be used with the accompanying battery jar. The outer shell *A* is made of either fine-mesh screen or perforated metal. The mesh or perforations should be fine enough to prevent peas from passing through, but coarse enough to allow free flow of brine. The top is open, but the bottom *B* is closed with perforated metal. One-half of the bottom is welded to the outer shell, but the other half is hinged so that it can be opened and closed.

A metal partition *C* divides the cylinder in half vertically. The bottom of this partition coincides with the division between the permanent bottom and the hinged bottom. Attached to this partition and coincident with the vertical axis is a free-turning shaft *D*, to which are welded two semicircular metal shelves or plates, *E* and *F*, exactly 2 in. apart and parallel to the bottom. One of the vertical halves of the metal partition *C* is slotted to permit these plates to pass through when the knob *G* is turned. A handle *H* is attached to the partition. Any dimensions can be used, except that the distance between the two semicircular rotating plates must always be exactly 2 in.

Easy to Operate

Operating the separator is quite simple. Fig. 2 shows all the equipment necessary for the test, with the exception of a timer. The peas to be tested are placed upon plate *E*. (It is necessary that plate *E* and *F* be directly above hinged bottom *B*.) Then the separator, is immersed in the salt brine solution in the battery jar, the separator being lowered until the brine contacts the peas on plate *E*. At this instant, knob *G* is turned one-half revolution, which moves plates *E* and *F* through the slots to the other side of the partition. This scrapes the peas off plate *E* into the brine and removes the plates from the field of operation. After 10 seconds, the knob is turned to its former position and the separator removed from the brine. All the peas that are sinkers are trapped between bottom plate *F* and the hinged bottom *B*. This bottom is opened by unlatching *J*, releasing the floaters into a pan where they can be counted quickly and the maturity calculated. While the bottom is still open, a twist of the knob completely unloads the cylinder, so that when it is again closed the separator is ready for the next test.

This separator can also be used to determine the maturity of frozen peas and frozen lima beans, as brine solutions are employed in grading these products.

By acquainting the canning and freezing industry with the principle and construction of the pea separator, it is hoped that this technic will eliminate to a great degree the variables encountered in evaluating the maturity of canned peas, so that pea grading based upon the Federal standards can be accomplished with more speed, accuracy, uniformity and objectivity than has been possible with the methods heretofore used.

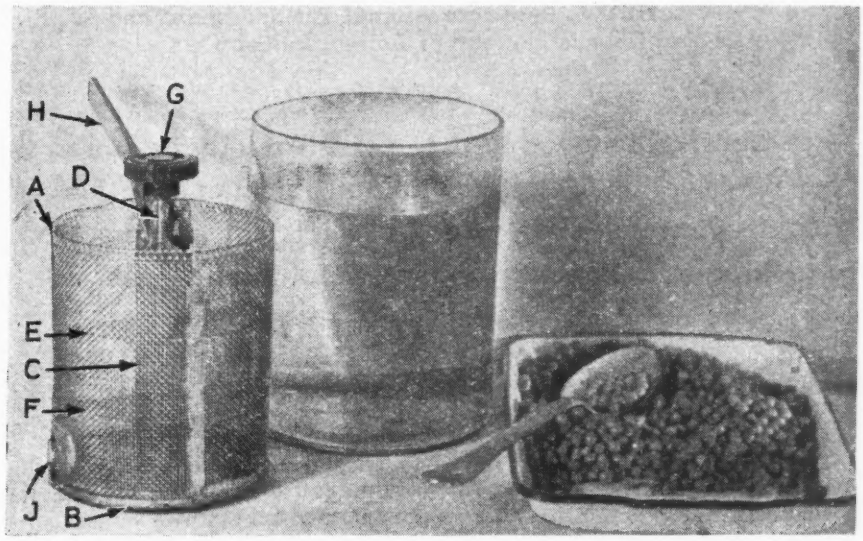


FIG. 2. All the equipment needed for a maturity test except the timer—separator, jar of salt brine and pan of peas. "A," outer shell; "B," perforated bottom; "C," vertical partition; "D," shaft; "E" and "F," plates which turn with shaft; "G," knob on shaft; "H" handle attached to partition, "J," latch on hinged half of bottom.

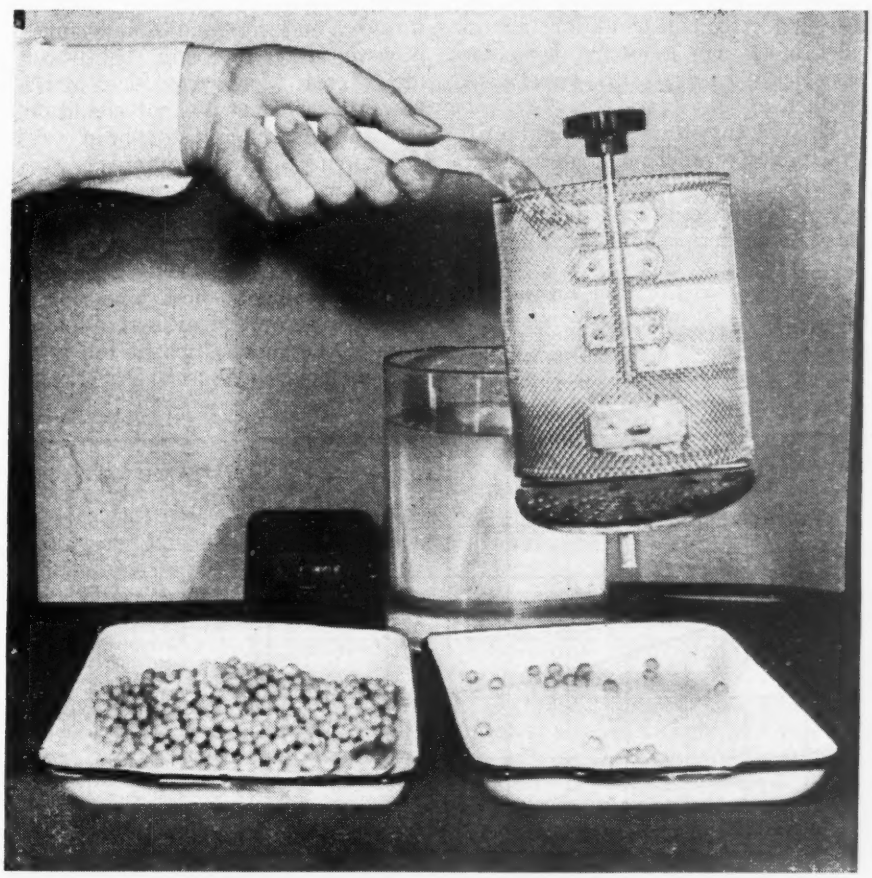


FIG. 3. The pea separator in operation. Turning handle drops peas from top plate into brine solution. Turning it back ten seconds later traps floaters above bottom plate, separating them from sinkers. Then separator is lifted from brine and bottom opened to drop sinkers into tray.

Coating of Fat Protects Meat Against Freezer Burn

By R. L. HINER, Associate Animal Husbandman, and W. R. KAUFFMAN, Assistant Chemist, Bureau of Animal Industry*

After dipping in melted lard, frozen meat may be stored at zero degrees for 64 weeks without objectionable loss of weight. Plain butcher paper protects fat coating from scratching and persons handling meat from grease

IN recent years there has been a great increase in the use of freezer storage for preserving fresh meat. It has occurred in rural communities and on farms as well as in the meat industry.

The expansion in rural areas is indicated by the increase in frozen food locker plants from 1,269 in 33 states in 1938 to 4,559 in 47 states in 1943.†

One of the major problems in storing frozen meat is to prevent desiccation. Under certain conditions almost all the ice will evaporate from the meat, leaving a dry, pithy, unpalatable product.

To prevent this "freezer burn," moisture-vaporproof materials are used in wrapping the meat before it is frozen. War needs have made these paraffined papers, cellophane, latex and other special products difficult to obtain.

Review of Literature

The limited study made of wrapping for meats for freezer storage has, for the most part, been with various types of papers. All investigators have agreed that a moisture-vaporproof wrapping was necessary to prevent drying of the stored meats. Moran[6] found that kidneys stored for six months at −10 deg. C. (14 deg. F.) unwrapped were shrunken and withered; those wrapped in waxed paper were only slightly better; whereas those wrapped in aluminum-foil were in excellent condition. He concluded that "store-burn" was due to excessive evaporation of water and that it could be prevented by suitable wrapping. The report of Callow[1] shows that fresh frozen hams stored at −10 deg. C. for 22 weeks, with no protection, lost 2 percent in weight and showed bad signs of freezer burn. Other hams, treated the same but protected in special bags made of aluminum foil and sealed with paraffin, lost no weight, but they did show slight signs of freezer burn. A third group of hams was frozen, then surrounded with chipped ice. This reduced the shrinkage about one-third, but did not prevent a considerable amount of freezer burn. Stiles[7] reported that temperature of storage, humidity and rate of air movement were important factors: The lower the temperature, the higher the humidity and the less the movement of air, the less the shrink. He suggested the use of water to form an ice covering on the frozen meat and wax or parchment paper as suitable materials to retard shrinkage. Griswold and Blakeslee[8] found that weight loss during storage for 180 days at 0, 5 and 15 deg. F. was very small in the case of vaporproof cellophane, followed by those samples coated with lard or 75 percent lard with 25 percent tallow, and greatest in case of a kraft wrapping paper. Palatability decreased with the increasing storage intervals of 60, 120 and 180 days. Furthermore, those samples stored at 15 deg. F. had a more intense and desirable flavor of fat and lean than those stored at 0 deg. F. This was contrary to the findings of other investigators. Loeffel and Yung,[4] comparing lard, ice glaze and tallow, found very little loss in weight of three beef roasts stored 11 to 12 weeks. How-

* Agricultural Research Administration, U. S. Department of Agriculture.

† K. F. Warner, Frozen Food Locker Plants in the United States, 6th annual count, 1943 (mimeographed).

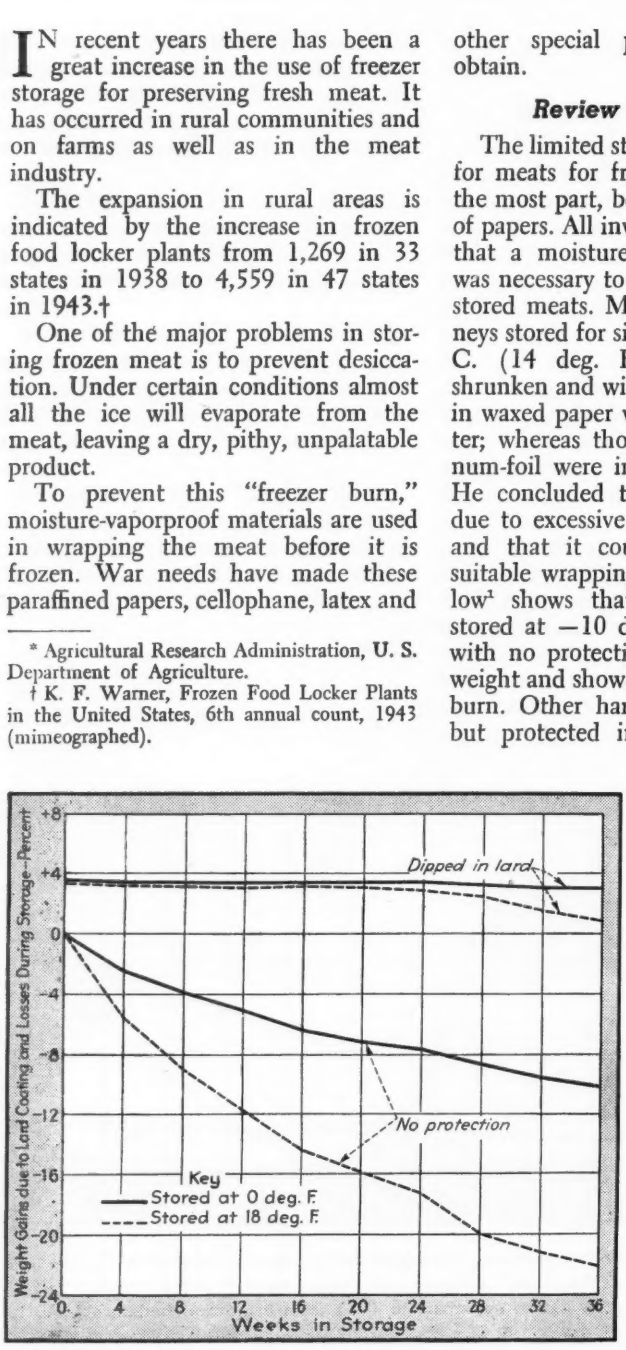


TABLE I—Free Fatty Acid Content of Meat and Its Lard Covering, Also the Stability of the Latter.

Treatment	Storage time (weeks)	Free fatty acid content of meat [1]	Free fatty acid content of lard [1]	Stability of lard
Initial value (fresh)....	0	0.701	0.500	Less than 2 hours
Frozen and stored at 18 deg. F.				
No protection.....	12	1.44	.....	
No protection.....	24	1.44	.....	
No protection.....	36	1.95	.....	
Lard-dipped.....	12	1.30	0.502	Less than 2 hours
Lard-dipped.....	24	1.46	0.505	Less than 1 hour
Lard-dipped.....	36	1.60	.....	Less than 1 hour
Frozen and stored at 0 deg. F.				
No protection.....	12	0.854	.....	
No protection.....	24	0.630	.....	
No protection.....	36	0.69	.....	
Lard-dipped.....	12	0.822	0.500	Less than 2 hours
Lard-dipped.....	24	0.633	0.487	Less than 2 hours
	36	0.87	.....	Less than 1 hour

[1] Percent of oleic acid based on extracted fat.

FIG. 1. Percentages of lard used in coating frozen pork loin cuts and subsequent losses of the protected and unprotected samples stored at 18 deg. F. and 0 deg. F. for 36 weeks. All percentages are based on weights of the frozen samples.

ever, it was necessary to renew the ice glaze frequently. Paired mates were frozen, wrapped in deodorized kraft paper and stored. They showed a slight weight loss in 11 to 12 weeks. Except for a slightly larger dripping loss for the wrapped samples, only small differences were reported for the cooking and palatability tests.

Summary and Conclusions

Studies were made of methods for protecting meats from desiccation in freezer storage. Coating materials employed were lard, beef tallow, ice and combinations of lard and beef tallow.

Pork loin cuts as well as chops cut 1 in. thick lost considerably more weight in freezing at 18 deg. F. than at 0 deg. F. Coating the sample with lard prevented weight loss.

Pork loins at 0 deg. F. had less free acidity and the fat was more stable after 12, 24 and 36 weeks' storage than similar samples stored at 18 deg. F. The latter were rancid after 24 weeks.

There was little difference in flavor of fat between protected and unprotected pork loin samples after storage at 18 deg. F. for 12, 24, and 36 weeks, although the flavor did become more intense and less desirable with each succeeding storage period. The intensity and desirability of the flavor of lean also showed only small differences. Little difference was noted between those samples stored with and without protection at 0 deg. F. Storage for 36 weeks at 0 deg. F. resulted in a better quality product than for 12 weeks' storage at 18 deg. F.

Unprotected pork loins stored 52 weeks at 18 deg. F. lost twice as much weight as those stored at 0 deg. F. A small shrinkage was found in loins stored at 18 deg. F. with various thicknesses of lard covering. The same was true for those stored at 0 deg. F. although the loss was even less. Ice glaze was unsatisfactory unless renewed frequently. Pork chops stored with a similar lard coating at 18 deg. F. had a larger weight loss than the loin samples.

Beef cuts coated with 50 percent lard and 50 percent beef tallow, 25 percent lard with 75 percent beef tallow, and pure beef tallow, and stored 64 weeks at 0 deg. F., had greater weight losses than samples coated with lard. The combinations of lard and beef tallow were intermediate with respect to weight losses, with that containing 50 percent lard most closely approaching the pure lard. Frozen samples dipped in beef tallow at 200 deg. F. had less weight loss during storage than others dipped at 100 or 150 deg. F. Beef tallow applied at 100 or 150 deg. F. and 25 percent lard with 75 percent beef tallow at 100 deg. F. chipped off.

The fat coatings were easily removed from the frozen samples with hot water or in a warm oven.

It is concluded that meats may be frozen, dipped in melted lard at 100 to 200 deg. F. and stored at 0 deg. F. for 64 weeks with very satisfactory results relating to control of weight loss. Protection of fat coating from scratching, and the person handling the cuts from grease, may be accomplished by wrapping the coated meat in plain butcher paper.

Procedure

The purpose of the investigations reported here was to determine (1) the effect of lard and other materials used as coatings on changes in the weight and palatability of meat in freezer storage, and (2) the relation between temperature of coating material when applied and weight losses of meat in freezer storage.

The roasts and chops used in the tests reported here were from hogs fattened on a standard ration, consisting of corn and a protein-mineral supplement in dry lot. The hogs were slaughtered at a live weight of approximately 225 lb. After chilling at 33 to 35 deg. F. for 72 to 96 hours, the carcasses were cut and the loins trimmed, leaving a uniform ¼-in. layer of fat covering. Five days after slaughter, the paired pork loins were cut into roasts of approximately equal weight.

One-half of the loins from the right side of the carcasses were frozen at 0 deg. F. and the other half at 18 deg. F., without forced circulation of air. The temperature in each freezer was maintained within ±2 deg. F. of the specified temperature at all times. The relative humidity of the 18-deg. F. freezer was approximately 85 to 90 percent; that of the 0-deg. F. freezer, 90 to 95 percent. The corresponding samples from the left side of the carcasses were frozen at the other experimental temperature in each case. The chops were cut 1 in. thick and were handled in the same manner as the loins, one from each pair (right and left) being frozen at 18 deg. F. and its mate at 0 deg. F. The roasts and chops remained in the freezers overnight. This period was more than long enough to freeze them solidly.

The beef roasts were from beef-type, dual-purpose type and "cross-type" steers. The steers were fed a standard ration in dry lot and slaughtered when they individually reached a weight of approximately 900 lb. After chilling for approximately 96 hours, the paired short loin and rib cuts were removed from the carcass. On the fifth day, roasts consisting of 2½ lumbar vertebrae were cut from the short loins and the 6-7-8 rib cuts were divided in halves, making four pairs of roasts from each carcass. After cutting, all roasts were frozen overnight at 0 deg. F.

A string was threaded through each sample before freezing, so as to facilitate dipping in the melted lard or tallow or the water.

The lard used was rendered from the fat of the carcasses from which the loins were obtained. It consisted of back, leaf, plate and trimming fats and was firm. After grinding, the fat was rendered in an open, steam-jacketed kettle at 250 deg. F. until the cracklings were a golden brown and had settled to the bottom of the kettle.

The lard was strained and then chilled at 33 deg. F. where it remained until ready for use. The solid lard was melted and kept up to the selected temperature by setting the container in hot water that was heated by steam.

The tallow used in these tests was obtained from the same carcasses as those from which the beef samples were cut. It consisted of the kidney fat. After grinding, the fat was rendered in an open, steam-jacketed kettle at 250 deg. F. until the cracklings were a golden brown and had settled to the bottom. The melted tallow was strained and then stored at 35 deg. F. until needed.

In the first test, 19 pairs of pork loins were used. Half were frozen at 18 deg. F. and the others at 0 deg. F. Nine of the loins from each freezer were immersed in melted lard held at 105 deg. F. They were removed immediately and hung in the cooler at 35 deg. F. for a few minutes to allow the lard to harden. The covered loins were then reweighed and for storage were placed in the same freezer in which they were originally frozen. The paired mates were stored unprotected as check samples. There was little difference in weights of the four groups of fresh loins as they went to the freezer

During freezing, the loins at 18 deg. F. shrank 1.87 percent and those at 0 deg. F., 1.15 percent. The gain in weight due to dipping in lard was similar for the two groups.

In these studies the covered samples of meat were laid singly on a wire rack in such a way that no two touched. No difficulty was experienced in handling the individual samples in weighing, and all weighings were made in the freezer to avoid any melting of the coverings.

At intervals of 12 weeks, three representative samples were removed from each group for organoleptic and chem-

ical tests. The loin samples selected for these studies were removed at the proper time, weighed and allowed to remain approximately 24 hours at a room temperature of 45 deg. F. A small sample was then removed from each loin and the three samples representing one set of storage conditions were ground and used for chemical studies relating to fat breakdown.

A study was made of the stability of the lard used in covering these samples. The technic used for these determinations was that developed by King and others (4) in which the development of rancidity is accelerated by aerating the lard in a test tube held at a temperature of approximately 208 deg. F.

It was determined that removal of the lard, tallow or lard and tallow coating may be done by either of two methods. First, the frozen meat may be placed in warm water and allowed to remain until the covering has melted. The meat is then removed and thawed. The lard will congeal on top of the water and can be easily removed. The second method is to place the meat in a heated oven and allow the lard to melt and drip into a pan. This melted lard can be disposed of then if it shows signs of rancidity or, if desired, it can be left in the pan and mixed with the drippings resulting from the roasting of the loin.

Results

During storage, those samples with no protection at 18 deg. F. lost moisture at a much faster rate than those at 0 deg. F. (Fig. 1). The loss in case of samples dipped in lard was nearly equal to the lard covering after 36 weeks at 18 deg. F., whereas those stored at 0 deg. F., lost very little. The loss in the protected samples was assumed to be moisture, as lard did not chip off and some freezer burn was noted in those samples stored at 18 deg. F., after the lard coating was removed.

The chemical determinations for rancidity, expressed as free fatty acid content, or percentage of oleic acid per gram of extracted fat, are shown in Table I. The technic used for obtaining these determinations was that outlined by Jamieson.[3] It will be noted that at the end of 12 and 24 weeks there was little difference in the free fatty acid content of the protected and unprotected samples stored at 18 deg. F. However, at the end of 36 weeks those samples stored unprotected had increased more rapidly in free fatty acid than similar samples protected with the lard coating. At 0 deg. F., little difference in free fatty acid was found between the protected and unprotected samples at the end of any of the three storage periods. However, as between temperatures there was a decided difference at each of the three intervals in favor of those samples stored at 0 deg. F. It is of interest that samples stored for 36 weeks at 0 deg. F. had less free acidity than similar samples stored at 18 deg. F. for 12 weeks.

• As shown in Table I, the lard used to cover these samples had a stability of less than two hours. No change in stability of the lard was noted after 12 weeks of storage at 18 deg. F., or 24 weeks at 0 deg. F. However, after 24 weeks' storage at 18 deg. F., the stability was less than one hour, whereas at 0 deg. F. it required 36 weeks to lower the stability to less than one hour.

After removal of the sample for chemical analysis, the remaining portion was roasted in a ventilated electric oven at 302 deg. F. to an internal meat temperature of 149 deg. F. The roasts were then removed and judged for intensity and desirability of flavor of fat and lean by a committee of experienced judges. As shown in Table II, there was little difference in the intensity of flavor of fat between the samples protected and unprotected in storage at 18 deg. F. However, the protected samples had a more desirable flavor of fat after 36 weeks' storage than did the unprotected loins, stored 24 weeks. The intensity of the flavor of lean did not change the first 24 weeks, but after 36 weeks both groups became less intense, as shown by the scores. After 12 and 24 weeks' storage, the desirability of the lean from protected samples was superior to that of the unprotected samples.

The intensity of flavor of fat and lean for the two groups of samples stored at 0 deg. F. showed only small differences for each storage period studied. However, the intensity of flavor of fat increased with each succeeding storage period, whereas that of the lean remained nearly constant. The desirability of flavor of fat decreased with each succeeding storage period, being "slightly undesirable" after 36 weeks' storage. This was not true for the lean of those samples, as the greatest change was noted between 12 and 24 weeks for both groups of samples. They were still "moderately desirable" at the end of 36 weeks' storage. It will be noted that loins protected with lard were somewhat more desirable in flavor of lean after each storage period. It is of interest that loin samples stored for 36 weeks at 0 deg. F. were more desirable than similar loins stored for 12 weeks at 18 deg. F. Also, little difference was noted in intensity and desirability of flavor of fat from protected and unprotected samples at any one period of storage at one temperature, whereas the lean portion of the sample was considered to be the same or slightly superior for those protected by a coating of lard.

Other Coatings and Combinations Studied

In another experiment, involving pork loins and chops, study was made of weight losses only, for a 52-week

TABLE II—Palatability of Pork Loin Samples After Freezer Storage.

Treatment	Number of samples	Storage time (weeks)	Flavor of fat [1] Intensity	Flavor of fat [1] Desirability	Flavor of lean [1] Intensity	Flavor of lean [1] Desirability
Frozen and stored at 18 deg. F. No protection	3	12	4.10 Moderately pronounced	2.30 Slightly undesirable	4.00 Moderately pronounced	3.80 Moderately desirable
	3	24	4.30 Moderately pronounced	1.70 Slightly undesirable	4.00 Moderately pronounced	3.30 Slightly desirable
	4	36	4.50 Pronounced	1.33 Undesirable	3.55 Slightly pronounced	3.20 Slightly desirable
Lard-dipped	3	12	3.70 Moderately pronounced	2.70 Slightly desirable	4.00 Moderately pronounced	4.20 Moderately desirable
	3	24	4.30 Moderately pronounced	2.30 Slightly undesirable	4.00 Moderately pronounced	4.00 Moderately desirable
	3	36	4.27 Moderately pronounced	1.90 Slightly undesirable	3.60 Moderately pronounced	3.03 Slightly desirable
Frozen and stored at 0 deg. F. No protection	3	12	3.50 Moderately pronounced	3.40 Slightly desirable	3.90 Moderetely pronounced	4.10 Moderately desirable
	3	24	4.00 Moderately pronounced	2.70 Slightly desirable	4.00 Moderately pronounced	3.70 Moderately desirable
	4	36	4.18 Moderately pronounced	2.33 Slightly undesirable	4.05 Moderately pronounced	3.75 Moderately desirable
Lard-dipped	3	12	3.50 Moderately pronounced	3.00 Slightly desirable	4.00 Moderately pronounced	4.60 Desirable
	3	24	3.30 Slightly pronounced	3.30 Slightly desirable	4.00 Moderately pronounced	4.00 Moderately desirable
	3	36	4.23 Moderately pronounced	2.30 Slightly undesirable	3.87 Moderately pronounced	4.30 Moderately desirable

Maximum score possible 5.0, minimum 1.0.

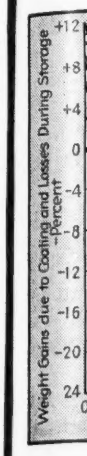


FIG. 2. frozen unprote percent

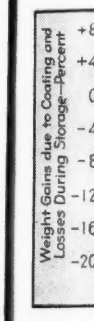


FIG. 4. frozen the pro weeks.

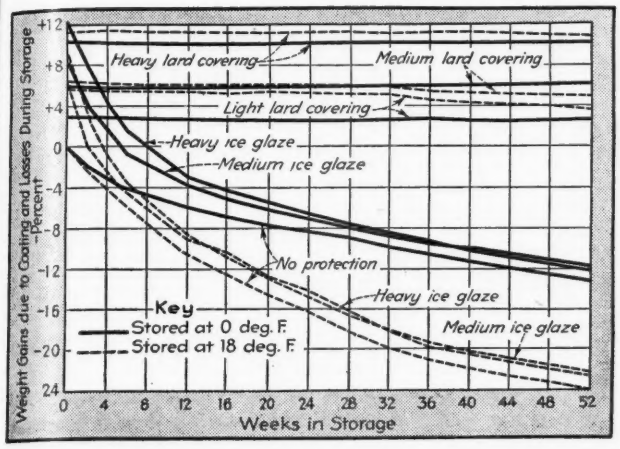


FIG. 2. Percentages of lard and ice glaze used in coating frozen pork loins, with subsequent losses of the protected and unprotected samples stored at 18 and 0 deg. for 52 weeks. All percentages are based upon weights of frozen samples.

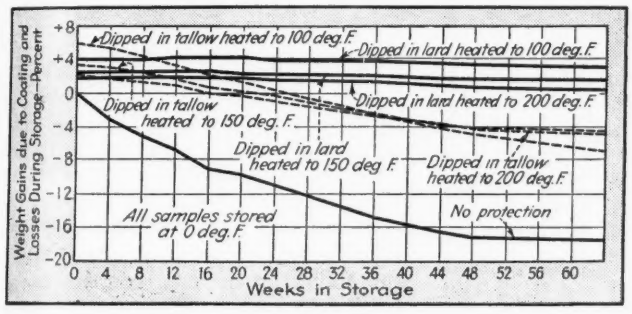

Dipped in tallow heated to 100 deg. F.
Dipped in lard heated to 100 deg. F.
Dipped in lard heated to 200 deg. F.
Dipped in tallow heated to 150 deg. F.
Dipped in lard heated to 150 deg. F.
Dipped in tallow heated to 200 deg. F.
All samples stored at 0 deg. F.
No protection
Weight Gains due to Coating and Losses During Storage—Percent
Weeks in Storage

FIG. 4. Percentages of lard and beef tallow used in covering frozen beef chuck, rib and loin cuts with subsequent losses of the protected and unprotected samples stored at 0 deg. for 64 weeks. All percentages based on weights of frozen samples.

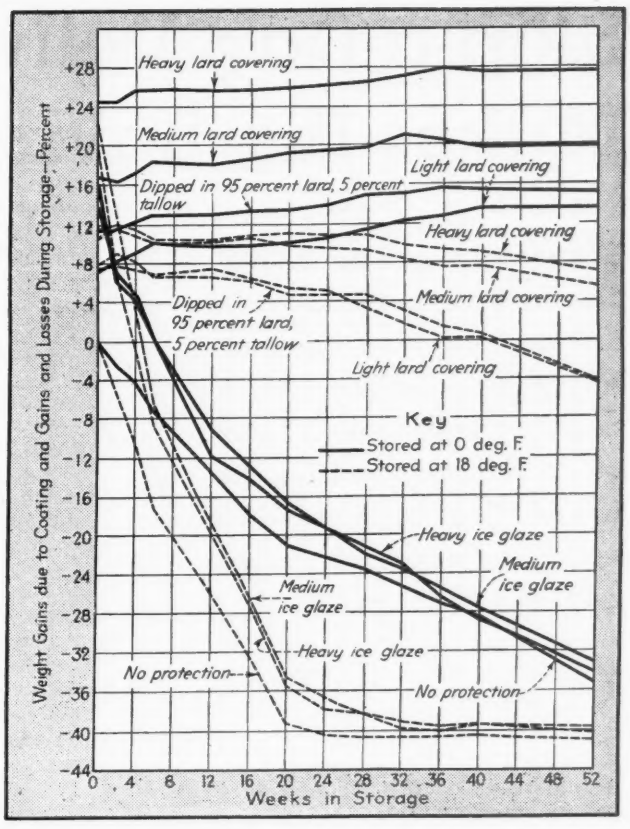


FIG. 3. Percentages of lard, ice glaze and a mixture of 95 percent lard with 5 percent beef tallow used in coating frozen pork chops, with subsequent losses of the protected and unprotected samples stored at 18 and 0 deg. F. for 52 weeks. All percentages based on weights of frozen samples. As in the other experiments, the amount of shrinkage was greatest for the products stored at a temperature of 18 deg. F. (See also the curves in Fig. 2.)

period. The coverings in the case of the loin samples were lard and ice glaze, whereas those for the chops also included lard containing 5, 3 and 1 percent beef tallow. Temperatures of freezing and storage were 18 and 0 deg. F., without forced circulation of air. Steps were taken to obtain three thicknesses of covering in case of lard and two for the ice glaze. The heavy coatings were obtained by leaving the frozen meat sample in the hot coating material (105 deg. F.) until the desired percentage of lard had congealed. This was determined by frequent weighings. The coated sample was then removed, hung at 35 deg. F. to harden, weighed and placed in its respective storage room. The water glaze was applied by placing the frozen meat sample in water that had been prechilled to 33 deg. F. and allowed to remain until the desired amount of glaze had formed on the sample.

The results of these tests are shown in Figs. 2 and 3. As in the other experiments, shrinkage during freezing was greatest at 18 deg. F. However, the chops had greater shrinkage than the loin samples. Shrinkage losses for those samples protected by lard were negligible at both temperatures, whereas those protected by an ice glaze lost this protection in 3 to 6 weeks.

As noted in Fig. 3, the pork chop samples stored at 0 deg. F. gained slightly in weight during storage. This can be accounted for partly in weighing, as it was all done at 0 deg. F. and the samples were small, varying from approximately 0.30 to 1.00 lb. The increase was probably from moisture that condensed on the fat coating when the freezer door was opened and the room allowed to warm up a few degrees for a short period.

Temperature of Coating Materials When Applied

In further work, beef cuts were used to determine the proper temperature of the material when applied to the frozen meat. The coating materials were heated to 100, 150 and 200 deg. F. and the frozen cuts dipped, removed, hung up until the material was hard, weighed and placed in the freezer. The following materials or combinations were used: pure lard, 50 percent lard with 50 percent beef tallow, 25 percent lard with 75 percent beef tallow, and pure beef tallow. All samples were frozen at 0 deg. F. and stored at the same temperatures for 64 weeks.

As expected, the amount of covering in each type of covering material was greatest when the coating material was heated to 100 deg. F., and least when heated to 200 deg. F. Weight loss during storage occurred in all cases, the least being in case of pure lard, and the greatest in case of tallow. As shown in Fig. 4, the temperature of the lard used made little difference as all three groups shrank less than one-half of one percent. This was not true for tallow as the least weight loss was found in those samples dipped in tallow of 200 deg. F. and the most in those from tallow at 100 deg. F., due to the heavier tallow coating chipping off. With respect to combinations of lard and tallow, that made up of 50 percent lard with 50 percent tallow proved to be slightly better than that containing only 25 percent lard, due to less cracking and chipping off of the coating material.

The chief objection to the use of tallow was that it cracked and chipped off when handled. This was especially

(*Turn to page 137*)

Skip-a-Day Delivery Makes Big Savings

Connecticut experiment station finds alternate-day milk delivery an effective conservation measure when home refrigeration is adequate. Holds promise for future. Conclusions show a reduction in truck miles, gasoline and tires

WHERE home refrigeration is adequate, alternate-day milk deliveries are effective in conserving our critical resources of gasoline, rubber, oil, motor trucks and manpower. These are the conclusions reached by Connecticut Agricultural Experiment Station in a study conducted for over a year at Storrs, Conn.

Annual Savings High

In 1943, alternate-day milk deliveries in Connecticut saved 1,000,000 gal. of gasoline, 46,000 tires and eliminated nearly 200 milk routes. There also were savings in the number of trucks used and the number of men employed. Even further economy may be anticipated as the full potentialities of alternate-day delivery are utilized.

Every-other-day milk deliveries to save gasoline and rubber began shortly after ODT issued directives to reduce truck mileage. In some states, including Connecticut, a voluntary adoption of the plan was not unanimous. Some dealers stressed the convenience to consumers of daily deliveries. Milk had then to be kept only one day instead of two. Such action jeopardized the whole plan, and on June 24, 1942, the Connecticut milk administrator declared daily milk delivery an unfair trade practice.

Subsequent orders compelling alternate-day deliveries covered 89 of the 169 towns in the state, nearly 80 percent of the population, and affected approximately 75 percent of the retail milk delivery. Other dealers have since adopted the plan, so that now more than 85 percent is delivered on the every-other-day basis. Similar conditions exist in other parts of the country. It is estimated that approximately 50 percent of the retail milk delivery in the United States is now on an alternate-day schedule. In general, the every-other-day plan has been adopted most completely along the Atlantic and Pacific seaboards. In some cases, dealers operate on a six-day week with no Sunday deliveries. In New York City, voluntary adoption of the alternate-day plan was prevented by the War Labor Board when it responded to demands from the drivers' unions. This action delayed the program in a number of the milk markets.

But where the plan has been put into effect, definite savings have been made. These result from reductions in the distances traveled by delivery trucks and in the time required to deliver any given quantity of milk.

The mileage reduction is effected by covering the delivery sections of the routes only half as often. Time is saved both by this cut in mileage and by larger deliveries per stop, which also means that fewer trucks and drivers are needed.

Running a route every other day does not necessarily mean 50 percent savings in mileage, gasoline and tires. The length of run from the station to the first stop on the route and minor consolidations with other routes are two of the factors which cause the savings to vary.

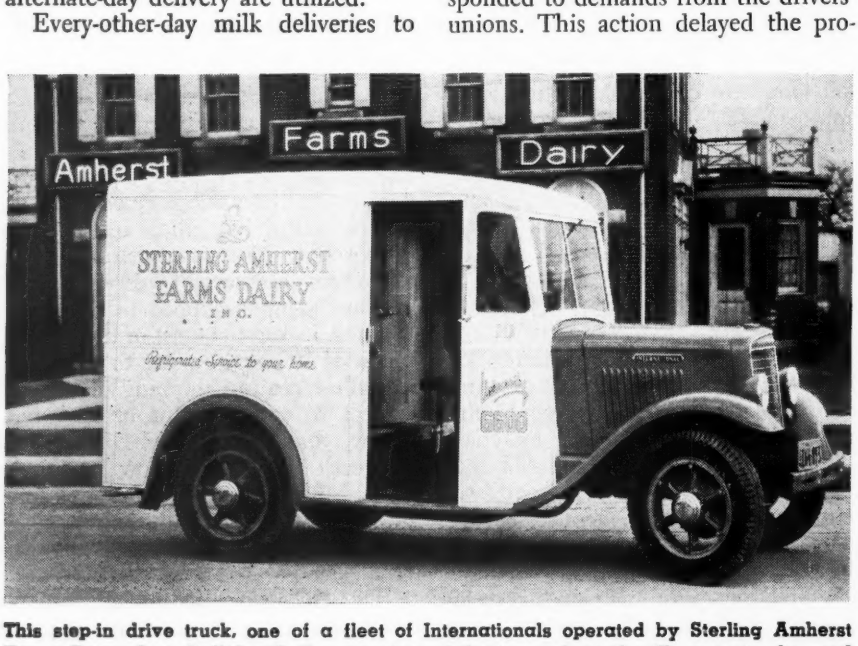
Two Systems

In some instances, alternate-day deliveries are made on the skip-route basis in which the normal two-day volume is distributed in one day, with no deliveries on the alternate day. However, the most common method is to split the route into two parts and deliver one part one day and the other the following day. When the latter method does not require a full day's work by the driver, parts of adjacent routes are added to the split-route to increase its volume and cut down the total number of routes.

A summary of the reduction in mileage by the various methods is given in Table I, taken from Storrs Agricultural Experiment Station's *Bulletin* No. 247. The table shows that in 1942 the alternate-day delivery program, including the elimination of special deliveries, reduced the retail truck mileage an average of 44 percent in Connecticut markets. Additional savings were made in 1943 by further route consolidations. Average loads were increased from 300 to 380 qt. a day. Where maximum consolidations were made, typical routes were increased to 450 qt. per day.

In terms of conservation, the program cut the use of gasoline and tires 40 percent. Total truck repair expense was lowered because fewer miles were covered and because some trucks were removed from service and held as reserves. In the beginning, man-hours were reduced 30 percent. Some of this reduction was the result of shorter hours per route. As route consolidations were made, route time increased, so that in 1942 only 14 percent of the men were freed for employment in war factories or to join the armed forces.

By the spring of 1943, the number



This step-in drive truck, one of a fleet of Internationals operated by Sterling Amherst Farms Dairy, Inc., Buffalo, N. Y., is typical of the type of retail milk route trucks used in experiments made by the Connecticut Experiment Station, in 1942 and 1943.

TABLE I—Summary of Daily and Alternate-day Retail Delivery Operations for 100 Connecticut Milk Dealers, 1942.

Sub-classification	Daily delivery: No. of dealers	No. of routes	Daily quarts	Daily miles	Alternate-day delivery: No. of routes	Daily quarts	Daily miles	Percent reduction in miles	Percent change in volume
All routes	100	440	133,528	16,310	378 1/2	134,144	9,147	44	0
Classified by type of adjustment [1]									
Split routes	62	139	40,266	6,133	139	40,459	3,710	40	0
Consolidation	17	271	87,159	9,280	224 1/2	87,625	4,995	46	+1
Skip routes	21	30	6,103	897	15	6,060	442	51	−1
Classified by type of dealer [2]									
Merchant dealer	26	279	88,723	9,884	234	88,490	5,442	45	0
Producer dealer	58	135	37,482	5,185	121	38,409	2,986	42	+3
Subdealer	16	26	7,323	1,241	23 1/2	7,245	719	42	−1

[1] Split routes are routes that have been split into two parts with one delivered on one day and the other on the following day. Consolidation represents a further modification, with volume per route increased and the number of routes decreased. Skip routes are those where the normal two-day volume is delivered in one day, with no deliveries on the alternate day.

[2] Merchant dealers buy all of their milk from producers; producer dealers produce some or all of the milk they distribute; subdealers buy only from other dealers and usually after it has been processed and bottled. These definitions are in line with those used by the Connecticut Milk Administration.

TABLE II—Summary of Costs of Operating Retail Milk Trucks Under Daily Delivery Conditions.[1]

Items	Overhead per day (dollars)	Operating Costs: Fixed per day (dollars)	Variable per mile (dollars)
Gasoline	.....	0.264	0.0140
Oil	.....	.....	.0009
Tires	.....	.035	.0030
Repairs	.....	.....	.0260
General garage and storage	0.501	.....	.....
Depreciation	.479	.....	.....
Insurance	.187	.....	.....
Taxes and license	.105	.....	.....
Interest	.113	.....	.....
Totals	1.385	0.299	0.0439

[1] Based on data for several hundred specialized delivery trucks of all makes. In practically all cases the normal capacity of these trucks was about 500 qt. See Storrs Agricultural Experiment Station *Bulletin* 248 for details.

of men had not grown, even though milk sales had gone up nearly 10 percent. Because of the draft, the alternate-day program since then has been of even greater benefit to the nation's milk dealers.

The Cut in Costs

Every-other-day delivery has, of course, affected the cost of route truck operation. A summary of the costs of operating retail milk trucks under daily delivery conditions has been made by the experiment station and is shown in Table II. Applying the costs in Table II to the route descriptions in Table I indicates that, during the latter part of 1941, the average delivery cost was 4.06 cents per quart on an average route of 37 miles daily, with 303 qt. delivered. By 1943, the average volume had increased to 380 qt., with a daily mileage of 23.

If alternate-day deliveries continue in the postwar period, total delivery costs may drop to 2.74 cents per quart, saving 1.32 cents, provided the weekly earnings of the route men return to normal prewar levels.

Refrigeration a Must

Studies were made to determine if the milk would remain wholesome and palatable over the 48-hour period between alternate-day deliveries. At summer temperatures both raw and pasteurized milks soured in less than 24 hours when they were not kept in refrigerators. However, when stored under refrigeration, their condition remained satisfactory for at least 48 hours. Most of the sample bottles of refrigerated milk remained in good condition for the four-day testing period.

That alternate-day deliveries were satisfactory from the health standpoint was substantiated by health officers in Connecticut markets. It was pointed out, however, that every-other-day deliveries should not be attempted during the hot summer months in markets where the majority of homes do not have refrigerators or some other means of keeping the milk cool.

While alternate-day delivery is not a complete solution to the wartime conservation problems of the dairy industry, it is an important adjustment. To the industry, this adjustment has entailed little or no sacrifice, and it holds much promise for the future.

First-Aid Fire Fighting

PART I—The three different classes of fires and the procedure for fighting each is explained

THERE are three distinct classes of fire, says the Safety Research Institute, and effective "first aid" fire fighting requires the use of a suitable extinguisher for each. The classes are determined by what is burning, and are designated as *A*, *B* and *C*.

Fires in ordinary combustible materials, such as wood, paper, textiles, rubbish and the like are Class A fires. They are put out best with water, which has a cooling and quenching effect. Extinguishers which contain water or chemicals and water are the soda acid, foam, pump tank, gas cartridge and loaded-stream types.

Vaporizing liquid and carbon dioxide extinguishers also are effective for controlling small Class A fires, if the fires are not deep seated and if there are no strong air currents to dissipate the vapor or gas.

Fires in flammable liquids, grease, and so forth, are placed in Class *B*. Here a blanketing effect is essential to cut off the oxygen supply. Suitable extinguishers are foam, vaporizing liquid, carbon dioxide and loaded stream.

Fires in electrical equipment, Class *C*, require the use of extinguishants that will neither damage equipment nor convey an electrical charge along the hose stream to the operator. Vaporizing liquid and carbon dioxide extinguishers are suitable for use on fires of this class. However, in some cases, fires in electrical equipment may be such that the quenching and cooling effect of large quantities of water is necessary. In such cases the equipment should be electrically deadened before water or water solution is applied.

The Underwriters' Laboratories label on every approved fire extinguisher indicates the class or classes of fire for which the extinguisher is considered suitable and the number of such extinguishers regarded as necessary to comprise one unit of protection. Thus, a 2½-gal. foam extinguisher is designated "A-1; B-1," which means that it is approved for use in both Class A and Class B fires and that one such extinguisher is required to make one unit of protection.

The number of units of protection required in any given location depends upon the relative severity of the incipient fire to be anticipated. The National Fire Protection Association recognizes three general classes of occupancies—(1) light hazard, (2) ordinary combustible and (3) extra hazardous. A guide for determining the number of units of protection required for each class has been worked out.

The inspection department having jurisdiction usually will determine the degree of hazard of a given occupancy.

Better Way To Dry Salt Fish

Use of controlled atmosphere in the drying of salted fish gives improved quality, reduces the amount of spoilage and requires less handling than the old method of natural drying outdoors

By ARNOLD WEISSELBERG, Consulting Engineer, New York, and HERMANN WEISSELBERG, Engineer, Wyssmont Co., New York.

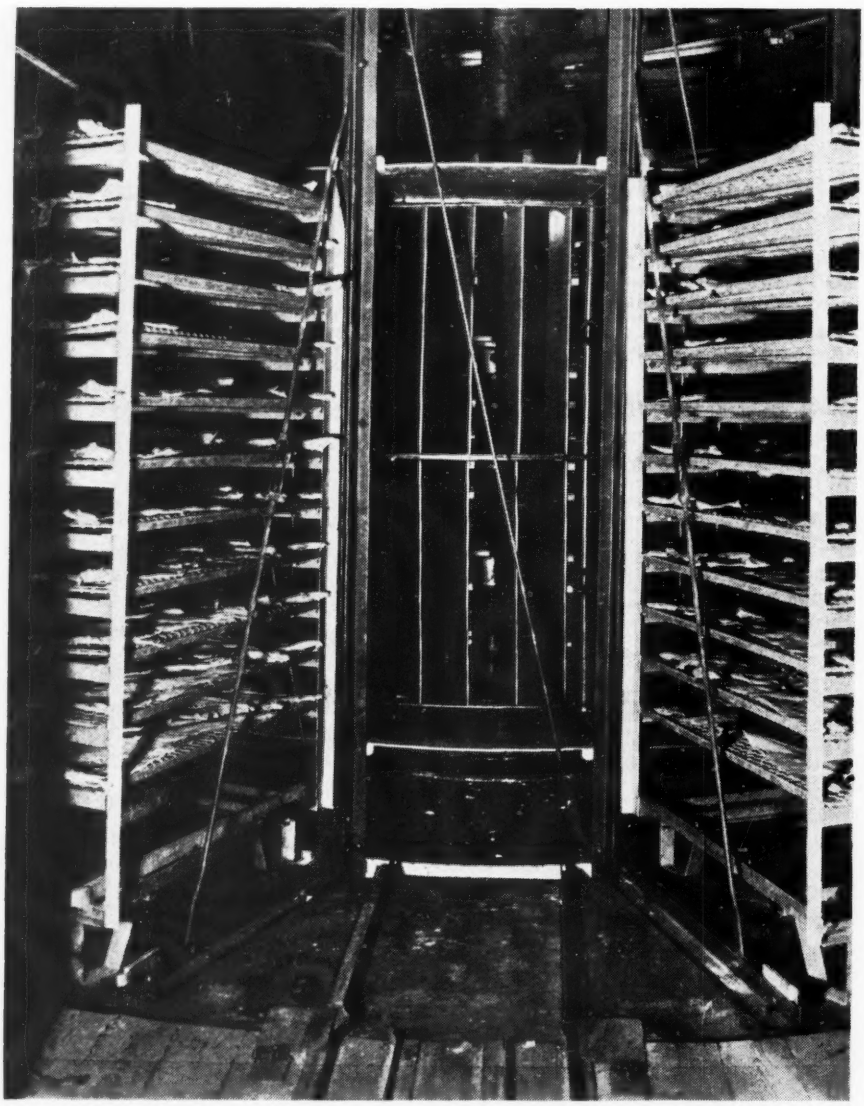
DRYING of salt codfish has been done through the ages, and most of this product is still made in the old way. This consisted of spreading the fish on wire trays that were placed outdoors during the daytime. At night, these were gathered and stacked into piles, to be spread out again the following day, and so on for several days, until the fish was dry.

There is no trouble with this method of drying when the air is dry and breezy. But those conditions do not always prevail, and then the fish is not satisfactorily dried, or it may even be spoiled. This is apparently true of conditions in Canada and Newfoundland, and explains why the fishing industries of these countries have been steadily losing markets for their salted dried fish. There is no question that improper drying is at the root of the trouble.

The advantages of artificial drying, especially in those places where climatic conditions are unfavorable for natural drying, are improved quality, reduced spoilage and less handling. But attempts to apply artificial drying in the salt fish industry, in the several instances known, have not yielded the results expected from them. The reason for this, it may be surmised, lies in the fact that these attempts were not preceded by a careful appraisal of all the factors involved, nor had the drying characteristics of salted fish been given sufficient study to obtain the necessary design data. In order to be successful, the class of equipment and the method of drying to be used require much thought and investigation. The many different sizes of fish, the varying degrees of salting, the changing requirements as to appearance and moisture of the dried product, the possibilities of attack by fungus, and so forth, introduce a multitude of problems that must be taken into consideration.

The extent of the groundwork laid for an installation in Nova Scotia nearly four years ago is difficult to convey in this article. An idea of the amount of research which preceded the final planning may be obtained from a paper by Dr. D. L. Cooper,[1] at that time Research Physicist of the Bureau of Fisheries in Halifax. This paper describes the work done in the laboratory with respect to drying, the conditions favorable to bacteria growth in all stages from green fish to market, the preservation of food value and many other factors influencing the quality of the dried product.

Now in its fourth year of operation, this plant fully justified the careful planning and preparations which preceded its erection. It must be mentioned as a distinct credit to Mr. F. H. Zwicker, Zwicker and Co., Lunenburg,



Looking through the open door of the circular fish dryer, the centrally located fan appears at the back. Trucks loaded with trays of fish are shown at right and left.

1. Experimental Drying, A. S. M. E. *Transactions*, vol. 63, No. 7, p. 621.

Nova Scotia, that he recognized the need for all this preparation before proceeding with the execution of the project itself.

The proper handling and processing of the fish prior to drying and storage is as important for a high-quality yield as the drying is in itself. The elaborate washing and cold-storage installation at this plant is, therefore, in a very high degree responsible for the success of this plant. But the drying installation is the heart of such a plant, and in this instance a radically different approach was made in solving the problem.

Mechanism of Drying

Fresh-caught fish is 87 percent water. Salting applied on board ship to preserve the fish until the boat reaches port causes it to lose some of this water. According to whether the fish is heavy or slack salted, the salted fish is between 53 and 57 percent water. It is usually dried to between 43 and 37 percent moisture, depending on its destination. A considerable amount of water, therefore, has to be removed in the drying process. When slack salting is practiced, approximately 18 lb. of salt are used for 100 lb. of dressed green fish. Heavy salting calls for 30 lb. per 100 lb.

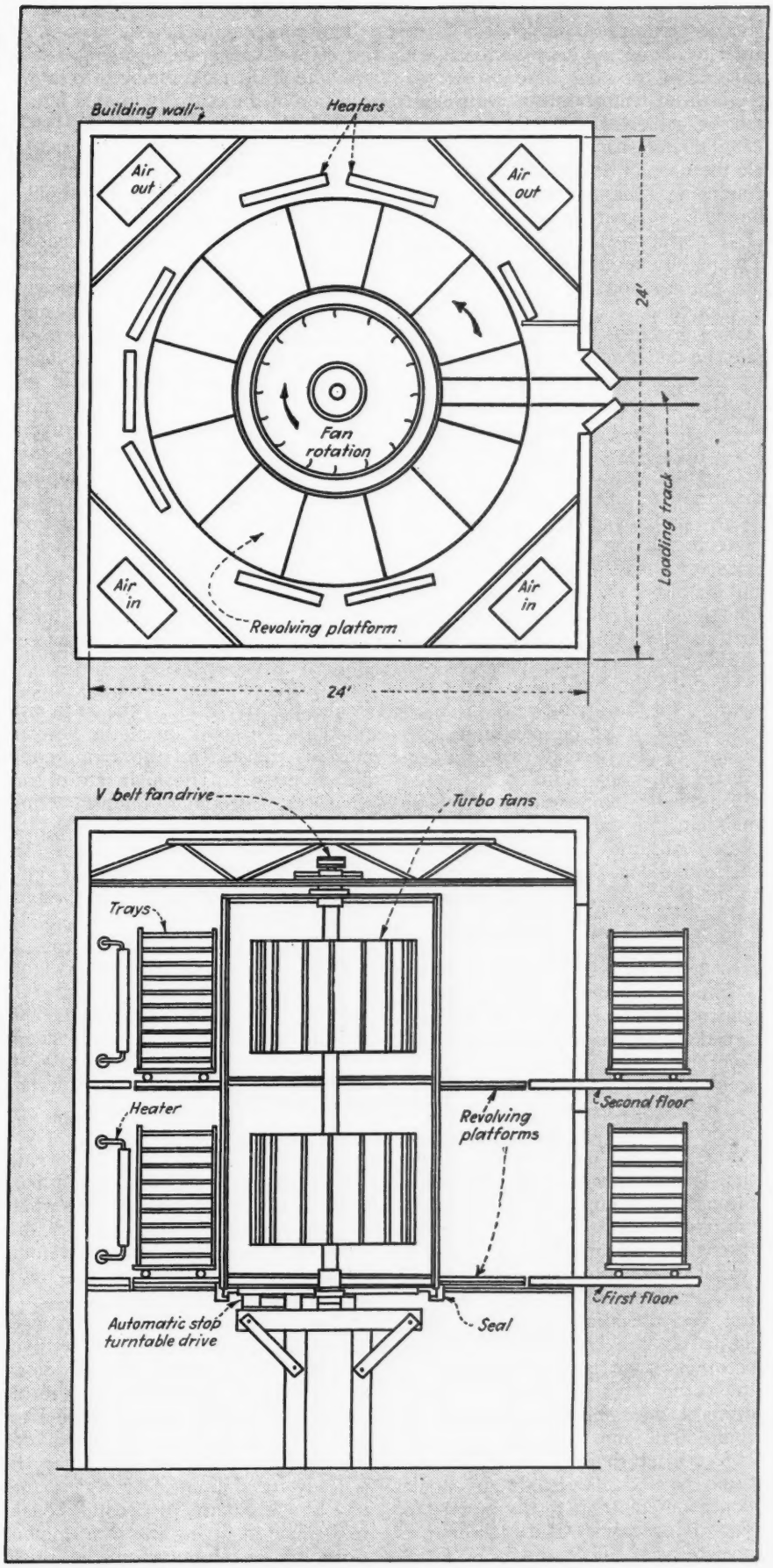
Since salted fish contains a saturated solution of salt, it behaves differently from materials that are merely wetted with water. The vapor pressure of the water in the fish is reduced to an 80 percent relative humidity line on a psychometric chart, instead of the saturation line.

The problem, as appraised, consisted first of so drying the fish that the formation of a heavy salt crust on the surface would be avoided. Second, the drying had to be carried out below the temperature at which the protein would coagulate and harm the dried product. And third, the fish should be handled as few times as possible, since salted fish is a low-priced commodity and cannot stand high labor costs.

Control of Evaporation Rate

The answer to the first problem was that drying would have to be done in such a way as to cause the moisture to evaporate below the surface exposed to drying. In other words, the drying must take place in a receding plane of evaporation. In this way salt is not carried to the surface where it would crystallize out and form a crust. Incidentally, the keeping quality of the fish is also enhanced. This must not be carried too far or casehardening will result.

It became evident that the air would have to be dehumidified during those seasons when the dew point of the air



Plan and elevation of the rotating platform tray dryer. The dehumidifiers and other apparatus, not shown, are installed in the basement under the first floor of the dryer. This compact arrangement simplifies air recirculation and the control of humidity. Spacing of heaters was determined experimentally to give the proper heating cycle.

outside exceeded about 45 deg. F., in order to obtain the drying rates necessary and at the same time not exceed the limit of temperature to which fish can be subjected during the drying. After careful analysis of all the available methods of dehumidification, that employing lithium chloride as a dehumidifying agent was selected in spite of all objections raised against its use. The performance so far has fully justified the selection.

Economic as well as technical reasons governed the decision to separate the drying into two operations—a first stage in which more than half the moisture is removed in a comparatively short time and a second stage in which the drying proceeds much more slowly, at a rate commensurate with the reduced rate of diffusion of the moisture in the partially dried fish. To complete the drying in one stage would involve too costly an installation. To put it another way, if drying were to be completed under the conditions of the first stage, it would reduce the dryer capacity of the entire plant out of proportion to the yield. On the other hand, if all the drying were to be accomplished under the conditions prevailing in the second stage, salt-encrusted fish would result.

Automatic temperature controls to maintain the temperatures within the prescribed limits supply the answer to the second consideration. The answer to the third is found in the plant layout and type of equipment selected.

First-stage Dryer

The type of dryer used is novel in construction and was especially designed to suit existing conditions. This dryer is shown schematically in the accompanying drawing.

To save space, minimize labor and provide control of drying conditions throughout the entire drying period, the loaded tray trucks are carried through the drying chamber on rotating platforms instead of being pushed through a long tunnel. At Lunenburg, two of these platforms are used, at the first, and second-floor levels, the control and operating machinery being located in the basement. The dryer occupies an area only 24 ft. square in the corner of a building. A tunnel dryer of the same capacity would be about 60 ft. long.

A central shaft is equipped with turbo fans which provide air circulation countercurrent to the progress of the drying racks. These turbo fans operate very efficiently, only 6 hp. being required to circulate the air at the rate of about 200,000 cu. ft. per minute, which is over 15 times the rate of air flow through the dryer.

The photograph shows a view into the dryer through the charging door, with one of the racks removed to show a portion of the centrally located fan.

The platforms carrying the tray trucks rotate around the central shaft. There are positions for 12 trucks at each level. Each truck, or rack, holds from 350 to 600 lb. of fish. There is one loading station at each level, where an operator removes the racks of finished material and pushes on the newly loaded racks. The trays on the rack can be pulled out like the drawers of a filing cabinet, thus permitting loading of one tray at a time without removing them from the rack. In this way, one man is able to tend the dryer.

The dryer can be operated continuously or as a batch dryer, depending entirely on the working conditions. When operating continuously, at predetermined intervals of time, depending on the size of the fish, one rack of dried fish is removed and is replaced by another holding wet fish. The turntable is then automatically advanced one position.

Heaters are disposed in a circle around the dryer to heat the air in circulation. The position of the heaters must be adjusted for the drying conditions needed. The high rate of air circulation maintains uniform temperature and humidity throughout. Separate heaters are provided in the air-supply system to preheat air during the cold season, when it is cheaper to take in outside air with low humidity and bypass the dehumidifier.

Depending on the size and weight of fish, this dryer has a capacity for first-stage drying of some 600 to 800 quintals of fish in the salt bulk state. In terms of water removal capacity, it removes from 150 to 200 lb. of water per hour.

Second-stage Drying

For second-stage drying, the fish is spread on wire trays, disposed in what may be termed a room dryer. Air, directly from the supply fan or bled from the dryer, is circulated over the trays by conventional propeller fans.

From here, the fish goes to storage where the air is maintained at a relative humidity which results in a very slow drying rate, so that over a period of months it will not lose more than 1 to 2 percent of moisture. It remains in storage for at least ten days before it is ready for shipping. This gives the moisture a chance to become equalized, since in drying the thinner portions dry out more than the thick parts of the fish. The temperature in the storage room is kept just low enough to prevent the growth of fungus.

In addition to its function as a first-stage dryer, the circular dryer is also used for finish-drying a shipment which calls for less moisture because of its special destination. In this case, the dryer is used as a batch unit and the fish is dried for a few hours to put it in the right condition for packing for shipping.

The air dehumidifying system consists of a bank of five contact-plate-type dehumidifiers, which are so connected to the duct work that any required amount of air may be diverted either to the first stage dryer or to the second stage dryer. The return air from both dryers, together with the air which has leaked into the system, is recirculated through the dehumidifier, which delivers the air at definite temperature and humidity. For this purpose, the temperature and concentration of the lithium chloride solution has to be controlled. A cooler controls the temperature, using sea water as a cooling agent. The spent lithium chloride solution is passed through a steam-heated exchanger which brings it up to the temperature required for regeneration in the concentrator, where the absorbed moisture evaporates and is carried outdoors, thus reconcentrating the solution.

The entire dehumidifying equipment is arranged under the dryer. An instrument panel next to the dryer on the first floor permits the reading of the dry-bulb and the wet-bulb temperatures of the air entering and leaving the dryer. The fish is weighed before and after drying, so that the amount of water removed can be checked and compared with that calculated from the readings on the instrument panel.

From the weight records of coal and fish, the heat consumption is shown to be 2,500 B.t.u. per pound of water removed, which agrees with the expected heat consumption.

Except for the usual difficulties encountered in breaking in a new system, this method of air conditioning, after the "bugs" were taken out, has performed satisfactorily. It now operates with a minimum of trouble and very low maintenance cost, even though it is attended by unskilled help. The main thing, however, is that the prime object was accomplished. In the opinion of the owner and the responsible people in the Canadian Bureau of Fisheries, an unvarying quality, which has demonstrated its value by enabling Canadian fish to be shipped to markets hitherto closed to them, has become a reality. Combined with the high degree of reliability of operation and low cost of production, this pioneering project can be termed a definite success.

Higher Voltage Saves Copper*

When you step up the voltage you can use smaller wire for the same load. Besides, you get relatively less drop in voltage

A WELL- KNOWN fact is sometimes overlooked in designing a lighting system. Higher voltage circuits use less copper than lower voltage circuits for a given load. There is, therefore, economy in higher voltages at utilization devices. This fact is illustrated in Fig. 1 for a simple radial circuit 100 ft. long supplying a balanced load of 75 kva. at the end of the circuit.

If the copper required by the 460-volt, three-phase, three-wire circuit is taken as unity, as in Fig. 1, the 460-volt, three-phase, four-wire circuit requires 1.3 units of copper because of the neutral conductor. The lower voltage circuits use correspondingly larger amounts of copper. The 120/240-volt, single-phase circuit requires 4.8 times as much copper as the 460-volt, three-phase, three-wire circuit. The lower voltage circuits use more copper than is indicated by the inverse ratios of voltage.

Current density, based on National Electrical Code ratings, is plotted against conductor sizes in Fig. 2. As the conductor size decreases the current density increases rapidly. The reason for this is that the relative surface area for dissipating heat is greater for small conductors than for large ones.

Better Voltage Regulation

Use of higher utilization voltages has the further advantage of providing better voltage regulation. The voltage regulation (percentage voltage drop) for a 460-volt, three-phase circuit is approximately half that of a 120/208-volt, three-phase circuit. The better voltage regulation of the higher voltage circuits can be utilized to conserve copper when voltage regulation is a limiting factor in a set length of circuit. For example, the 120/240-volt, single-phase circuit in Fig. 1 requires nine times as much copper as the 460-volt circuit for equal voltage drop.

It is evident, from the factors which have been discussed, that the highest practical utilization voltage should be used in all cases. But the values which have been cited can be realized only in a simple circuit under favorable conditions. In a complete distribution system there are several factors affecting the amount of copper that can be saved by going to higher utilization voltages.

One such factor is that some electrical equipment, including transformers, uses about the same amount of copper for a given load regardless of the utilization voltage used.

A comparison of the various possible distribution systems for supplying the lighting equipment in an industrial plant should be made to show which utilization voltage uses the least copper. If the luminaires can be supplied directly from 460-volt circuits, as in the case of fluorescent lamp luminaires, less copper generally is required in the lighting system (which includes the circuits, panelboards, and luminaires supplying power to the lamps).

* Prepared by Westinghouse Electric and Manufacturing Co.

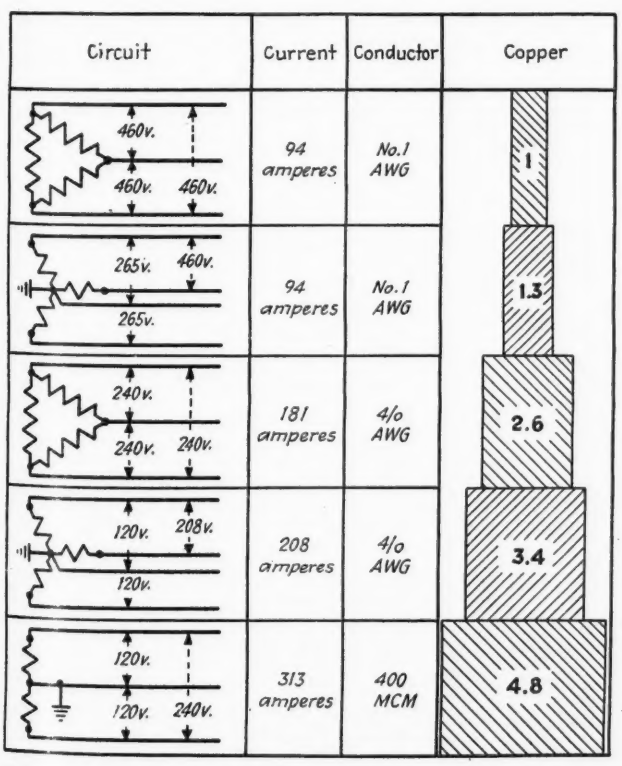


FIG. 1. Copper in a low-voltage circuit. Balanced load of 75 kva. at end of 100 ft. of circuit composed of Type R (N.E.C.) conductors. (AWG means American Wire Gage; MCM is thousand circular mills.) This chart illustrates the economy of higher voltage circuits.

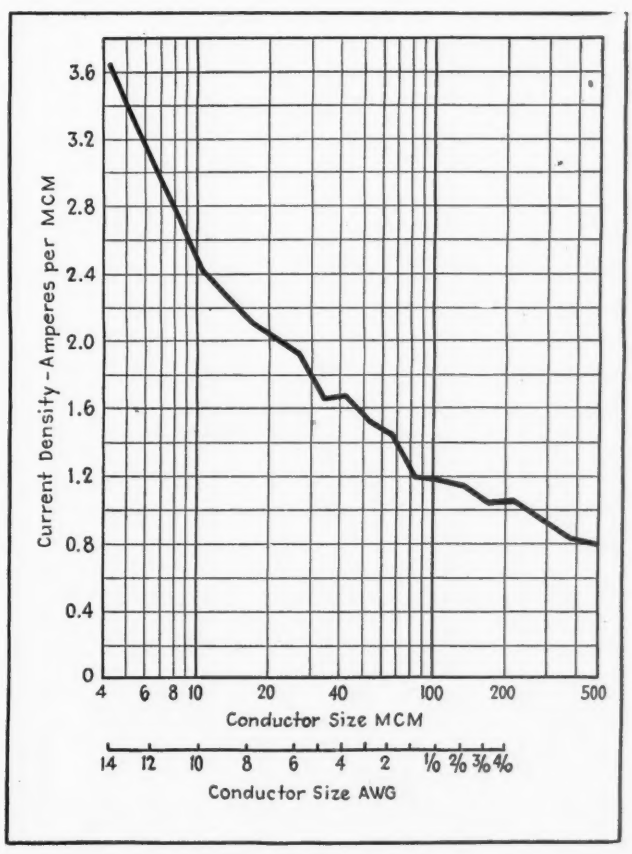


FIG. 2. Rated current density for Type R conductors.

Grapefruit Cannery Waste Yields Crude Citrus Pectin[a]

By G. N. PULLEY, Bureau of Agricultural and Industrial Chemistry,[b] and E. L. MOORE and C. D. ATKINS,[c] U. S. D. A. Citrus Products Station, Winter Haven, Fla.

Cannery residue may be scalded, leached, pressed and dried to produce a refined pomace which may be used by jam and jelly manufacturers as a source of pectin. Most of equipment needed is available. Cost is low

RAPID expansion of the jam and jelly industry in the United States and Allied Nations has resulted in domestic and export demands for powdered pectin in excess of the expanded capacity of the pectin industry.

Grapefruit cannery residue contains 2.5 to 4.0 percent of pectin. During the 1942–43 season, Florida canneries processed more than 17½ million boxes of grapefruit, yielding more than 322,000 tons of peel and pulp residue. Less than 60 percent of this residue was used commercially, the balance being hauled and dumped on pastures, groves and wasteland. Therefore, a large quantity of raw material for pectin is available.

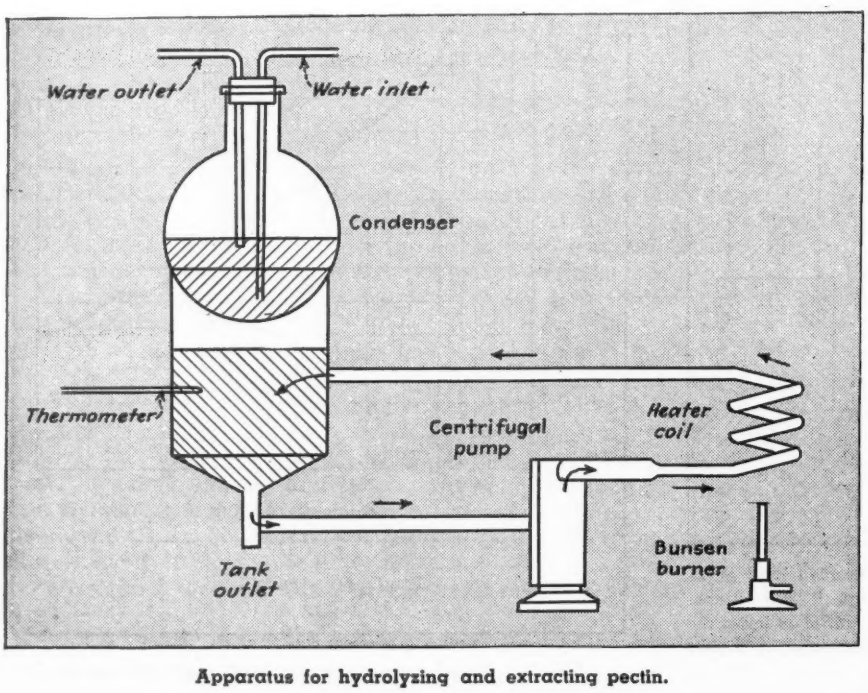
The manufacture of powdered pectin requires elaborate and specialized equipment. However, the cannery residue may be scalded, leached, pressed and dried in equipment, most of which is now available, to produce a refined pomace which may be used by jam and jelly makers as a source of pectin.

Poore,[1] Bosurgi and Fiedler,[2] Myers and Baker [3, 4] and others have described methods for preparing pectin from citrus fruits. All of these investigators carried the processing through to the point where they obtained a pure pectin. This report describes the production of a crude pectin or refined pomace by leaching grapefruit with water and subsequently drying and grinding the leached peel. Methods are also described for extracting the pectin from the dry pomace.

[a] Agricultural Chemical Research Division Publication No. 127.

[b] Agricultural Research Administration.

[c] Florida Citrus Commission Research Fellows.



Apparatus for hydrolyzing and extracting pectin.

Experimental

The basic process used in these experiments for preparing grapefruit pomace follows:

1. Grapefruit peel, obtained from a grapefruit canner, was tumbled in a wire screen (1 mesh to the inch) to remove the seeds.

2. The de-seeded peel was ground in a meat grinder, using a plate with holes ¼ in. in diameter.

3. The ground material was immediately mixed with boiling water (30 gal. of water per 100 lb. of peel) and vigorously agitated for 5 minutes at a temperature ranging from 194 to 212 deg. F. By heating the peel in hot water, the pectin-destroying enzymes were inactivated ([5]), the peel swelled, and a large part of the water-soluble impurities were dissolved.

4. At the end of step No. 3, sufficient cool water (about 50 gal. per 100 lb. of peel) was added to lower the temperature to 135 deg. or below, and the diluted mixture further agitated for 2 minutes. The liquid was then drained off and discarded. Dilution with cool water stops any acid hydrolysis of the protopectin, tends to crisp the peel, and also dilutes the dissolved solids in the liquid.

5. The wet pomace was added to cold water (35 gal. per 100 lb. of peel), agitated for 5 minutes, and the liquid drained off and discarded.

6. Step No. 5 was repeated.

7. The leached pomace was pressed to remove all liquid possible and dried[d] until the moisture content was 4 to 8 percent. The dried material was then ground in a mill to sufficient fineness to pass through a 20-mesh screen.

An experiment was carried out to determine the effect of adding aluminum sulphate to the last leaching tank so that more of the water could be removed by pressing. Aluminum sulphate was used because it is not poisonous and any residual aluminum salt left in the pomace would not be harmful. Samples of pomace were prepared as directed above through step No. 5. The sample was then divided into two equal parts. One part was mixed with water as specified in step No. 6; the other was mixed with water to which aluminum sulphate had been added equivalent to 0.1 percent of the weight of the peel. After draining off the free

[d] A cabinet dryer was used in these experiments—maximum temperature, 150 deg. F.

liquid through a screen the two samples of pomace were pressed (400 lb. per square inch). The pressed regular pomace had a moisture content of 83.3 percent; the aluminum sulphate-treated pomace had a moisture content of 77 percent. A commercial test on aluminum sulphate-treated pomace gave the results listed in Table I.

The commercial tests show that the addition of aluminum sulphate does not affect the pectin grade of the pomace and assists in removing the excess liquid.

Following the basic process and using water having a hardness of 136 parts per million (7.89 grains per U. S. gallon) as calcium carbonate, a batch of pomace was prepared and tested. It was found that 1.54 grams of pomace was required to form a standard jelly with 100 grams of sugar when extracted and treated as described later. Therefore, 1.00 gram of the pomace would gel 65 grams of sugar, and the pomace would be described as equivalent to 65-grade pectin.

Another batch was prepared by the basic process previously described, except that distilled water was used instead of tap water in step No. 3. This pomace was found equivalent to 70-grade pectin.

A quantity of grapefruit pomace, using semiplant-scale equipment, was prepared for the purpose of obtaining data on the commercial production of citrus pomace. The basic process was followed, using water with a hardness of approximately 94 p.p.m (5.45 grains per U. S. gallon) as calcium carbonate. This pomace also had a pectin grade of 70.

These three experiments indicated that water having a hardness of 136 p.p.m. (7.89 grains per U. S. gallon) or less, as calcium carbonate, may be used for leaching without materially reducing the pectin grade of the product.

In an effort to prepare a pomace containing water-soluble pectin, a quantity of peel was processed in the regular manner through step No. 5, then divided into three equal parts. One part was leached with a 2.8 percent solution of tartaric acid; another with a sulphur dioxide solution having a pH of 2.4; and the other part with a hydrochloric acid solution of pH 2.4. After leaching, the pomace was pressed and dried as usual. The dried pomace was extracted with boiling distilled water for 30 minutes. It was then cooled rapidly to room temperature and diluted to volume. The extracts were filtered clear before pectin and jelly strengths were determined. The pomace was found to be 28-grade and the amount of pectin extracted was as follows:

Acid treatment	Pectin extracted (percent)
Tartaric acid	12.03
Sulphurous acid	11.82
Hydrochloric acid	11.87

The method of extracting the pectin from the citrus pomace influences the amount and nature of the pectin extracted. The gelling power of the extract obtained is controlled by the time and temperature of extraction as well as the pH of the solution used. Vigorous agitation helps to maintain a uniform temperature of the mixture, and also keeps the pomace well dispersed throughout the solution. The apparatus designed for the purpose of securing a uniform extraction without losing water by evaporation is shown in Fig. 1. Referring to this figure, 1,000 ml. of acid solution was heated and placed in the extraction tank. After the acid solution had been brought to the desired temperature, a 20-gram sample of pomace was added, and the temperature of the mixture was maintained constant during the extraction period. In the case of sulphurous acid, the proper amount of acid was added after the water had come to the desired temperature in the extraction tank.

After extraction, the mixture was transferred to a 2-liter Erlenmeyer flask and cooled under running tap water. The cool mixture was filtered through a jelly bag using hand pressure to remove as much liquid as possible. The extract was allowed to age overnight. It was then adjusted to a pH of 3.0 ± 0.1 by neutralizing some of the acid with ammonium hydroxide and jelly tests were run. In the case of phosphoric acid extractions, 1 ml. of 50 percent citric acid solution was added to form a buffer salt, and then the pH was adjusted with ammonium hydroxide.

Jelly Tests for Pectin Grade *

In order to determine pectin grade, a preliminary series of jellies was prepared using varying amounts of pomace extract ranging from 1 gram to 4 grams and differing by about 0.5 gram. In each case, a weighed amount of pomace extract having a pH of 3.0 was put into a 1,000-ml. beaker and mixed with 100 grams of sugar. Distilled water was added to bring the total volume to 200 ml. and the mixture was rapidly heated, with constant stirring to prevent burning, and boiled to 65 percent sugar content (weight of mixture, 154 grams). The mixture was poured into a 4 oz. jelly glass, cooled with tap water and allowed to set overnight. The next day, the pomace jellies were compared with a standard jelly made similarly with 100-grade pectin (1 gram of which will gel 100 grams of sugar). Finger testing was used to determine which of the test jellies agreed most closely with the standard jelly with regard to texture, resiliency and consistency. Then another series of jellies was prepared containing amounts of pomace extract, close to that used for the test jelly selected, but differing from each other by only 0.05 gram. The grade of the pectin was calculated by dividing the weight of sugar used, 100 grams, by the weight of pomace

* The grade of a pectin has been defined as the weight of sugar with which one part by weight of pectin will form a standard jelly containing 65 percent sugar solids under suitable conditions of acidity.

TABLE I—Results of Test on Aluminum Sulphate-treated Pomace.

Sample No.	Treatment	Water content of pressed material (percent)	Pectin grade of dried material
1	Water alone	90.2	50–52
2	0.1% $Al_2(SO_4)_3$	88.8	50–52
3	0.2% $Al_2(SO_4)_3$	84.6	50–52

TABLE II—Extraction of Pomace with Citric Acid.
(Temperature of Extraction, 208 deg. F.)

Citric acid solution		Time of extraction (minutes)	pH of solution after extraction	pH of solution after adjustment	pH of finished jelly	Equivalent pectin grade
Percent strength	pH of solution					
1.1	2.0	35	2.70	3.05	3.03	55
1.1	2.0	50	2.50	3.04	2.97	40
1.1	2.0	70	2.47	3.02	3.05	35
0.5	2.25	40	2.77	3.07	3.05	35
0.5	2.25	60	2.82	3.00	2.99	35
0.5	2.25	80	2.81	3.05	3.03	35
0.2	2.50	60	3.81	3.01	3.00	30
0.2	2.50	80	4.12	3.00	2.98	25
0.2	2.50	120	4.51	3.03	3.01	15

TABLE III—Extraction of Pomace with Sulphurous Acid.

Sulphurous acid solution		Temperature of extraction deg. F.	Time of extraction (minutes)	pH of solution after extraction	pH of solution after adjustment	pH of finished jelly	Equivalent pectin grade
Ml. of 6% acid per liter of solution	pH of solution						
119	1.5	176	20	1.79	3.06	3.35	25
119	1.5	176	30	1.81	3.02	3.14	33
119	1.5	176	50	1.73	3.02	3.03	45
28	2.0	208	35	2.46	3.05	3.07	33
28	2.0	208	50	2.79	3.05	3.15	45
14.5	2.25	208	40	3.33	3.05	2.83	30
14.5	2.25	208	60	3.51	3.04	2.97	38
6.5	2.50	208	60	3.78	3.01	2.76	30
6.5	2.50	208	80	3.57	3.06	2.82	30

that produced a jelly which matched the standard jelly made with 100-grade pectin.

Multiple Extractions

It was found that a second extraction of the pomace was not practicable. Five grams of pomace was extracted with 400 ml. of hydrochloric acid solution (pH 2.4) for 30 minutes at 212 deg. F. After cooling and diluting to volume, the mixture was filtered clear with the aid of Filter-Cel. The residue was extracted again with fresh acid solution and treated in the same manner as the first extract. The first and second extracts contained 0.36 gram and 0.03 gram of pectin per 100 ml., respectively.

Five grams of pomace per 100 ml. of extraction medium gave a mixture which was too thick and gummy for optimum extraction of pectin. It was decided, therefore, to use a ratio of 2 grams of pomace per 100 ml. of extraction medium.

Studies with Commercial Pomace

The results reported in this part of the work were obtained by using dried grapefruit pomace prepared on a semi-commercial scale.

It was found that a 32-mesh pomace gave a better extraction of pectin than either a 16- or 64-mesh pomace. Extractions were carried out by using a phosphoric acid solution of pH 1.5 and an extraction period of 30 minutes at a temperature of 176 deg. F. The following results were obtained:

Mesh	Pectin grade
16	70
32	77
64	50

Studies were made on the efficiency of various acids as extracting media. Myers and Baker,[5] in following up the work of Tarr,[6] have shown the importance of pH control in the extraction of pectic materials as well as in the manufacture of jelly with pectin. The extraction of pectin with phosphoric acid solutions was suggested by the work of Myers and Baker.[4] In addition, citric acid, lactic acid, and sulphurous acid solutions were used as extracting media. The pH and the temperature of the extraction medium and the duration of the extraction process were the variables used in conjunction with each acid. Only a single extraction of the pomace was made. Twenty grams of pomace was used per 1,000 ml. of extracting medium, and all extracts were filtered through a jelly bag. The results obtained are presented in Tables II to V.

The results in Table II shows that when the pomace was treated with a citric acid solution of pH 2.0 for 35 minutes at 208 deg. F. a pectin of 55 grade was obtained. At pH values of 2.25 and 2.5, maximum pectin grades of 35 and 30, respectively, were obtained. When the pH value of the citric acid was 2.25 and the extraction period was 60 minutes, the extracted pectin gave a pectin grade of 35. Little adjustment of the pH was necessary from the time of extraction to the finished jelly. For simplicity of procedure extraction at pH 2.0 seems to offer the greatest possibilities.

Table III shows that extraction of pectin from the pomace with sulphurous acid of pH 1.5 for 50 minutes at 176 deg. F. yielded a 45-grade pectin. Extraction with this acid of pH 2.0 for the same length of time at 208 deg. F. also yielded a 45-grade pectin. The maximum pectin grades at pH values of 2.25 and 2.50 were 38 and 30, respectively. An advantage of a sulphurous acid extraction is that the sulphur dioxide is removed during the jelly-making process and thus does not leave a foreign acid in the jelly. A disadvantage is that it is necessary to buffer the extract to maintain the pH of the finished jelly at approximately 3.0.

A pectin grade of 70, which was the highest in these experiments, was obtained when phosphoric acid of pH 1.5 was used for a 30-minute extraction period at 176 deg. F. (see Table IV). When using phosphoric acid solutions of pH values of 2.0, 2.25, and 2.5 the maximum pectin grades were 40, 35, and 30, respectively.

The results in Table V show that lactic acid does not appear to be a suitable extraction medium. At pH values of 2.1, 2.25, and 2.50, the maximum pectin grades obtained were 36, 35, and 25, respectively.

Table VI shows the loss of gelling power caused by filtering the pectin solution absolutely clear. The pomace was extracted with a citric acid solution and the extract obtained divided into two parts. One part was strained through a jelly bag and the other part was filtered, using a filter aid and a Buchner funnel. In each test filtration materially reduced the gelling power of the pomace extracts.

TABLE IV—Extraction of Pomace with Phosphoric Acid.

Phosphoric acid solution: Ml. of 75% acid per liter of solution	pH of solution	Temperature of extraction deg F.	Time of extraction (minutes)	pH of solution after extraction	pH of solution after adjustment	pH of finished jelly	Equivalent pectin grade
7.0	1.5	176	30	1.76	3.08	3.04	70
1.7	2.0	208	35	2.75	3.02	3.08	40
1.7	2.0	208	50	2.73	3.02	3.10	35
0.8	2.25	208	40	3.28	3.03	3.05	33
0.8	2.25	208	60	3.37	3.00	3.03	35
0.3	2.50	208	60	3.67	3.02	3.04	30
0.3	2.50	208	80	3.74	3.05	3.01	25

TABLE V—Extraction of Pomace with Lactic Acid.
(Temperature of extraction, 208 deg. F.)

Lactic acid solution: Ml. of 50% acid per liter of solution	pH of solution	Time of extraction (minutes)	pH of solution after extraction	pH of solution after adjustment	pH of finished jelly	Equivalent pectin grade
40	2.1	35	2.58	3.03	2.97	36
40	2.1	50	2.45	3.01	3.02	33
18.75	2.25	40	2.93	3.06	2.88	33
18.75	2.25	60	2.87	3.05	2.80	35
6.0	2.50	60	3.30	3.06	2.78	25
6.0	2.50	80	3.33	3.03	2.75	25

TABLE VI—Pomace Extract Filtered and Unfiltered.
(Temperature of extraction, 208 deg. F.)

	pH of citric acid solution	Time of extraction (minutes)	pH of solution after extraction	pH of solution after adjustment	pH of finished jelly	Equivalent pectin grade
Filtered	2.0	35	2.45	3.0	3.05	45
Filtered	2.25	60	2.90	3.0	3.03	40
Unfiltered	2.0	35	2.95	2.95	3.02	65
Unfiltered	2.25	60	3.0	3.0	3.15	55

Summary and Conclusions

Methods for preparing dried citrus pomace from grapefruit peel are discussed. Enzymes may be inactivated and most of the soluble material removed by boiling the ground peel in water for 5 to 7 minutes. This treatment is followed by washing the peel with several changes of cool water. The extracted peel is then pressed to remove excess water and dried to a moisture content of 4 to 8 percent. When properly conducted, the combined washing and drying procedures result in the elimination of soluble constituents and essential oils, yielding a protopectin base of light color and neutral taste.

Laboratory and commercial tests show that the addition of aluminum sulphate to the last leach water will change the physical character of the pomace so as to assist in removing the

(Turn to page 136)

EDITORIALS

LAURENCE V. BURTON, Editor

Graham L. Montgomery

With deep regret FOOD INDUSTRIES records the death of Graham L. Montgomery, Associate Editor, who had been on the editorial staff since 1930. He died in his sleep of a heart attack on March 4, 1944.

"Monty," as he was known to everyone, was a licensed professional engineer; he was graduated from Columbia University with a degree in mechanical engineering in 1912. He was an authority on materials handling and author of the chapter on this subject in Perry's "Chemical Engineers' Handbook." Among the larger industrial jobs which he did was the conveyor installation at Life Savers Corp., Port Chester, N. Y., when he was connected with Lockwood Greene Engineers, Inc., consulting engineers. He also helped design and construct coke ovens, sugar refineries and vinegar plants.

In 1922 Monty joined McGraw-Hill as assistant editor of *Chemical and Metallurgical Engineering*, later becoming managing editor of *Power*. He subsequently transferred to the staff of FOOD INDUSTRIES as managing editor, becoming associate editor in 1940.

He was chairman of the Food Processing Committee, Process Industries Division, of the American Society of Mechanical Engineers. A Member of the Institute of Food Technologists, he was secretary of the New York section from its beginning.

We who have worked with Monty regret his passing more than we can express.

Getting by With Fewer Workers

Freezing workers to jobs in essential industries is likely to have considerable benefit to canners, according to opinion on the West Coast, where the turnover in this seasonal industry was about 300 percent last year. For even though there are fewer available workers for this food industry, the canners reason that if the turnover is reduced to 200 percent, they can actually get along with only two-thirds as many workers.

Workers are, of course, not actually compelled to remain at work against their will. But they may not change jobs without a release from their present employers except to be employed at higher skills with the approval of USES and WMC. The alternative is to stop all work for 60 days before getting another job.

The reasons for workers' desire to change jobs are many. Restlessness, boredom with repetitive work, shopping around for higher wages, lack of transportation, and housing and shopping problems are only a few of them.

Management's resourcefulness in meeting the controllable factors will be taxed to the limit as the war intensifies.

Soupers

Know what a "Souper" is? This new term was used at the recent convention of National Dehydrators Association. It refers to those manufacturers of dehydrated vegetable soups who merely mix up the ingredients, some of which are of vegetable origin, others of animal and mineral origin. They are not themselves dehydrators of the materials.

The Dairy Situation Is a Bit of a Mess

Few, indeed, have been the situations existing in foods where there is more conflicting information than in the field of dairy products. Here is an example. What has been alleged to be whole-milk powder has been offered to bakers at an attractive price. A sales argument for its use was that it contained enough butter fat to permit the baker to cut down on his shortening. The sellers explained that the reason for the situation was that there was a surplus of fluid milk in certain areas where there were no cheese factories, that consumers refused to buy OPA's idea of cream, that there were not enough butter ration points in consumer hands to take off the market all the butter that could be produced from this surplus, that the government had stopped buying butter until April so there was nothing to be done but run it into dried whole milk and sell it at whatever price could be obtained.

On the other hand, well-informed persons say that this situation is not as stated and that the reasons given are merely fictitious arguments. This version has it that OPA had defined whole dry milk, for which it has established ceiling prices, as the product from drying whole milk. It would have about 24 or 25 percent of butter fat. But OPA has failed to prohibit the production of anything of lesser butter fat content. Hence, certain alert firms are alleged to be producing a 15 percent "whole" milk on which there is no price ceiling and are having a swell time selling it.

This is but one instance of the conflicting stories. Another is about the government set-aside of butter. One version that has had wide publicity is that the government is going to release 20,000,000 lb. from government stocks to civilian use. This, despite protests from dealers that they would have none of it on account of the age of butter and its slow loss of quality. On the other hand, WFA is stated to have denied any such intention and to have alleged that the government stockpile of old butter would be issued to government users. Mebbe so.

The fact is, however, that the government has had so much butter in

storage that warehouses have been full and butter buying for government account has had to stop for several months. And then we can remember an attempt by a one-time president of Fox River Butter Co. to corner the butter market back around 1907. His stock of butter grew old and deteriorated in value faster than he could boost the market price by his buying. He took a grand shellacing and has ceased to be an important factor in butter ever since. But he did not have the power to force any government institutions to accept his butter.

Verily, the dairy product situation needs a rational overhaul and redirection.

Repercussions Of Alcohol Demand

Need for huge quantities of industrial alcohol for munitions manufacture has stopped all whiskey manufacture, as is well known. It has put a stop to nearly all gin production as well. Tropical rum distillers have gone in for gin manufacture, but failing to rectify their alcohol sufficiently, some of these imported gins have a bizarre flavor compounded of molasses and juniper.

Large distillers, sensing the trend toward wine drinking, have been buying wineries right and left. But government purchases and set-aside orders for raisins have cut heavily into the production of wine. According to retailer opinion, the result has been the elimination of the tank car and tank truck transportation of lower grades of wine.

Latest information has it that too many raisins have been set aside. Nobody seems to be happy.

Now's The Time To Overhaul Sales Policies

Top management and sales managers of corporations have an opportunity today that may never come again in their lives. They have an opportunity to overhaul their sales policies without recourse to the heroic methods needed in times when business indicators are below normal.

As a rule, the firms that could best benefit by the suggested overhaul of sales policies are those which do not have clean-cut or vigorously enforced policies. It is well known that policies of expediency are seldom the basis of enduring success. In a seller's market, however, it is possible to revise and adopt methods that are calculated to be those which are the best adapted to times when the going gets tough.

For instance, when a firm's sales go far above 10 percent to any one distributor, then that company's position is vulnerable. If, say, 40 percent of the sales volume were to be through a single distributor, the chances are that in the days to come the seller might be forced to compromise with the buyer, to the great disadvantage of the seller, or else lose a sickening amount of business. Such a compromise might mean business taken at so low a figure that it would be profitless, with the further possibility that a strike, a fire or an adverse court judgment might spell the death warrant of the business.

To expand on the possibilities of the day is needless for alert executives. The opportunity is here. Build for the future while you may.

A Good Superintendent Works Three Shifts

Every good superintendent wishes that he could stay on the job in a busy season all three shifts a day for seven days a week. By one little trick of proper planning, some superintendents manage to do this, in effect. Perhaps a good many others can and should.

The trick is simple. The superintendent installs a generous number of automatic control instruments. As many of these as possible he makes automatic continuous-recording instruments. Thus, his eyes are on the job in a very critical fashion, even when he is at home asleep.

It is difficult just now to get all of the equipment which the plant management would like. But it is still possible to get instruments of many sorts, especially those which do not require too much scarce metal and too many skilled mechanics for manufacture. Especially at a time when there are many new and relatively inexperienced people on the job, there should be as many instruments assisting them in control and recording what they have done as it is possible to place in the plant. The superintendent greatly extends his power of supervision with the aid of the records.

Handling Sticky Materials

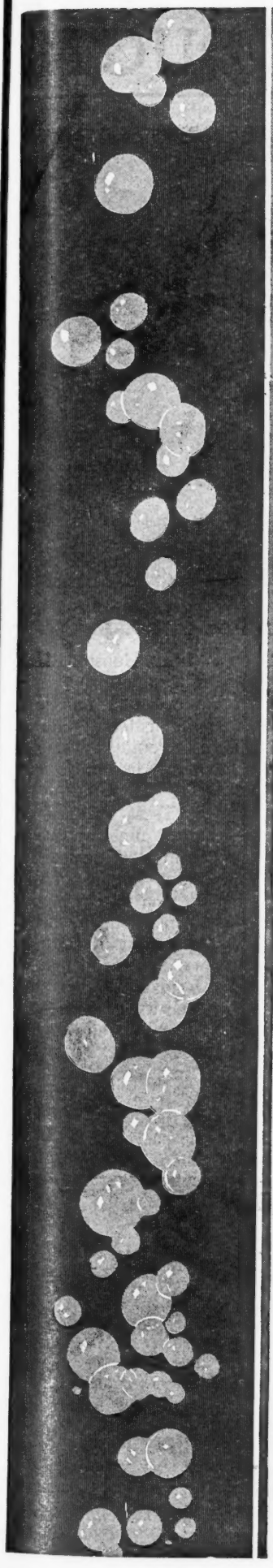
Probably there is no area of knowledge of food technology where so little is known as in the handling of sticky materials. Perhaps this is because there are so few food materials that are genuinely sticky. An old industry like baking knows so well how to handle doughs that it is doubtful if any baking technologist ever thinks of dough as sticky. The same can be said of the confectionery technologist with respect to the handling of hot hard candy, brittle taffy, caramel and chewing gum mixes. This is, however, not true of mincemeat or certain dried fruits, the makers of which still have to deal with their products as sticky materials.

Latest to experience the problem of stickiness has been the dehydrated soup mixer, in trying to conform to Army specifications by incorporating dehydrated yeast extracts that are high in vitamin B. This ingredient is very hygroscopic and is the production man's despair. We regret that the only suggestions that occur to us are to look for a nonhygroscopic source of the vitamin-B complex, if it can be found; or to mix the sticky extract with a dry ingredient, then pulverize, and work in a very dry atmosphere. This will require air conditioning and may necessitate special equipment.

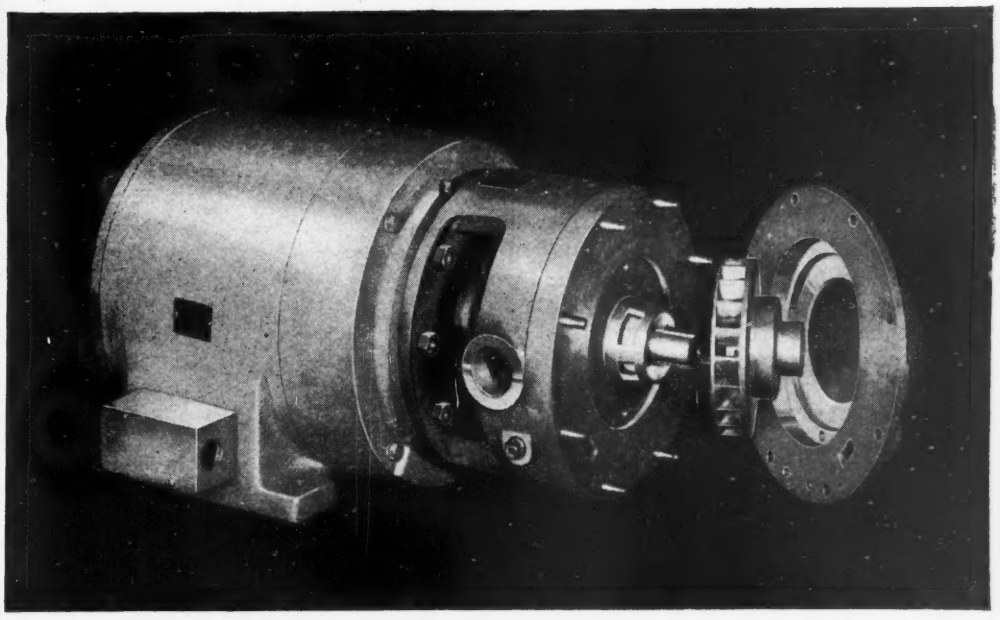
Thermophile-free Sugars

Production of sugars that are sufficiently low in thermophilic bacteria content to meet exacting standards is not particularly difficult. It involves more washing of the crystals to remove the mother liquors, followed by careful subsequent handling to avoid recontamination. Such bacteriologically acceptable sugars are in relatively small demand from most sugar refineries, and the handling of small lots in a huge plant is something of a nuisance. In production of bacteria-free sugars, the volume of washings is, of course, somewhat greater than in the production of standard granulated sugars.

Most of the larger refiners will produce this quality of sugar on demand for the sake of good will.



ONLY CLEAN AIR CAN REACH YOUR PRODUCT FROM A NASH COMPRESSOR



Here is a compressor designed perfectly to meet the needs of the Food Plants. It is simple, for it has only one moving part, a rotor cast in one piece and rotating in the casing without metallic contact. This means trouble-free operation over long periods. It is compact and requires little valuable floor space. Its oversize ball bearings seldom require attention or lubrication. No lubrication is required in the interior, so that the air is kept clean from the time it enters the pump. • But this is not all. The compressing medium in the Nash Pump is a rotating column of clean water. The air is in intimate contact with this water in passing thru the pump and is actually scrubbed while it is being compressed. Dust present in the atmosphere is removed, and the air delivered free from dirt, oil, or heat, without the use of scrubbers or air washers. Think what this means in terms of purchase cost and floor space occupied by complicated air washing apparatus. • These pumps are proving their worth in the most trying service. They are ideal for transferring beer or wort from tank to tank by air pressure, for maintaining pressure on aging tanks, for supplying compressed air to bottling machines in racking, etc. • Available in any capacity, these pumps deliver pressures up to 40 lbs. absolutely uniform without storage tanks. • You want the most reliable pumping equipment in your plant, so by all means find out more about the Hytor. Our catalog No. 217 is free on request.

THE NASH ENGINEERING COMPANY

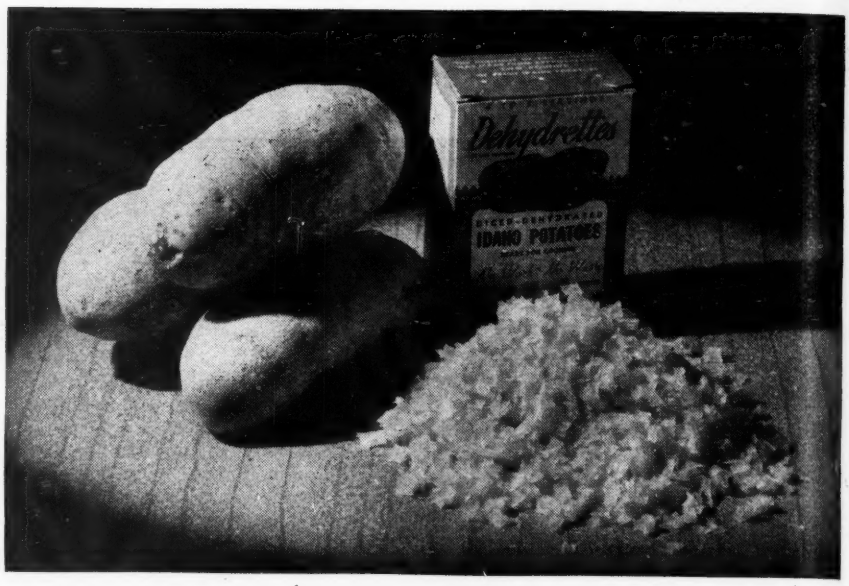
243 WILSON ROAD • SOUTH NORWALK, CONNECTICUT

NEW PACKAGES & PRODUCTS

Diced and Dehydrated

"DEHYDRETTES"—diced, dehydrated Idaho potatoes—are being distributed to the consumer market, for the first time, by Jack Gomperts & Co., San Francisco, Calif. Idaho Dehydrated Food Co., New Plymouth, Idaho, is the manufacturer of this product.

The dehydrated potatoes are packed in a 4-oz. standard bag-in-box container, the bag being of waxed glassine laminated to white kraft and heat sealed at the top. Two pounds of the fresh potatoes make four ounces of the dehydrated product, as shown in the accompanying illustration. After the contents of the package have been rehydrated and cooked, they will serve four to five people. The rehydrated potatoes are used in the same way as the fresh—plain, for salads, creamed or in soup. At present, the package sells for between 22 and 25 cents, retail, and its principal appeal lies in the quality of the contents and in the convenient method of preparation.



Two New Fish Products

"RED-E-SERV" Fish Loaf and "Billows" Flaked Fish are two new products introduced by fish processors. Although Red-E-Serv had been developed before Pearl Harbor, earlier restrictions on tin cans made it impossible for U. S. Conserve Co., St. Louis, Mo., to market the product. The fish loaf is made from fresh water fish, eggs, onion and seasonings and does not contain fillers of any kind.

This same product is also packed under another label known as "Blue Star" (Kosher) Gefilte Fish. Until recently, the gefilte fish had been distributed almost exclusively among Jewish servicemen at home, through USO clubs, and overseas.

Both these products are now manufactured for civilian use in No. 1 picnic size tin cans weighing 7 oz. The list of ingredients and directions for serving the fish are written in English and in Hebrew on the label of the Blue Star can.

Methods for serving the fish loaf vary according to taste and custom—either hot or cold. It is sliced and served in sandwiches and salads, as an appetizer, or as fishburgers on buns. The company is planning to pack the loaf in a No. 2 tin can, which will be more economical and easier to slice for small commercial restaurants such as lunch counters.

The flaked fish is prepared from freshly caught hake and put up in 15-oz. cans by Addison Packing Co., Southwest Harbor, Me. The hake, which is yellow in color, is seasoned with salt and cooked before canning. It is served creamed, fried, or as fish cakes.

A Wartime Package

NUTTY BROWN MILLS, Houston, Tex., is doing something about the paper shortage. It has designed a package which saves scarce materials and at the same time has promotion value to a degree customarily attributed only to fancy packages.

Nutty Brown's Texas Pralines are individually wrapped in scrap waxed paper and packed in a corrugated carton. An important feature of the package is that the carton is wrapped in ordinary kraft paper with the manufacturer's label design printed on it. The brown paper and the design of the label achieve an effect suggestive of the company and its location—part of the label design is a band showing famous cattle brands of the Southwest. Nor is that all. Because the container is sturdy it requires no shipping carton. The address label is simply glued to the outside of the package.

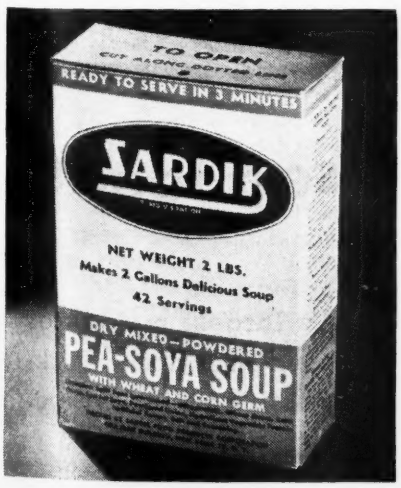
Herring—Frozen, Ground

LAKE SUPERIOR herring is now being marketed commercially, for the first time, being filleted and frozen by Otto L. Kuehn Co., Milwaukee, Wis. The frozen herring has proved so successful that other fresh-water fish are being filleted and frozen. The Army is buying large quantities prepared in this way. Packed in 5- and 10-lb. cartons, the fish are glazed with ice to protect them from freezer burn while in cold storage. The frozen fish are stamped by Federal inspectors, and Army seafood inspectors are on hand to see that the fish is fresh before being processed.

Ground herring is now being experimentally packed in 15-oz. cans by Lafayette Canning Co., Rockland, Me. If the product is successful, it will be used almost entirely for Lend-Lease and the feeding of Axis prisoners in Allied prison camps. A new method of grinding permits all sizes of herring to be used with a minimum of waste. The herring is gutted, the head removed and then the fish is processed into paste form. Canning the fish in paste form eliminates a great deal of labor.

Pea-Soya Soup

PEA-SOYA SOUP, which contains both wheat and corn germs, is Sardik Food Product Corp.'s newest addition to its list of 11 dehydrated products. The contents of a 2-lb. institutional-size chipboard container makes 2-gal. of soup, or enough for 42 servings. The soup is also packed in 5-oz. glass jars for consumer sale.

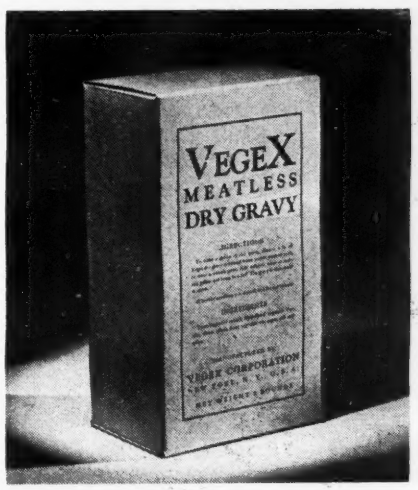


Pea-Soya Soup contains ingredients of such high food value that it adds proteins to meatless dishes or soups. It is served also as a substitute for cream sauce or in any scalloped meat or rice dishes.

The ingredients used in manufacturing the soup are split-peas, wheat germ, corn germ, low-fat soya flour, powdered onion, hydrolized vegetable protein, salt and seasoning. The split-peas are cooked to a soupy consistency and then dehydrated before combining with the other ingredients.

Meatless Dry Gravy

YEAST-VEGETABLE extract, hydrolized vegetable protein, starch, wheat flour, vegetable fat, sugar, salt and spices are the ingredients used by Vegex Corp., New York, in manufacturing its "Vegex" Meatless Dry Gravy. The mix is a complete product, and only



boiling water is needed in its preparation. It dissolves and thickens quickly, and 1-lb. of the dry mix makes 1 gal. of gravy. It comes in 5-lb. cardboard containers for the institutional market.

Stewed Muskrat

J. E. THUOT & Co., Iberville, Quebec, Canada, has introduced a specialty product, Stewed Quebec Muskrat, which sells for 89 cents for an 8-oz. can.

Packed in vegetable oil, the muskrat meat is dark, red-brown in color and

tastes like boiled beef, only oilier and less tasty. In view of the short supply of meat stocks, muskrat meat might conceivably be used in preparing stews, since points are not required to buy the product.

LOOKING AHEAD...

No merchandiser is fooled by the ease with which his product sells nowadays. Abnormal conditions are always temporary. That tough Buyer's Market may be just around the corner.

Buying habits are being formed today as always. Mrs. Consumer, whether consciously or unconsciously, continues to make a bee-line for Quality—and Quality is unmistakably typified by a distinctive, appetite-whetting package.

The Rossotti organization offers you a completely integrated service on fine Labels, Package Wraps and Folding Cartons—from sketch to finished product. Complete Art, Idea, and Merchandising Counsel.

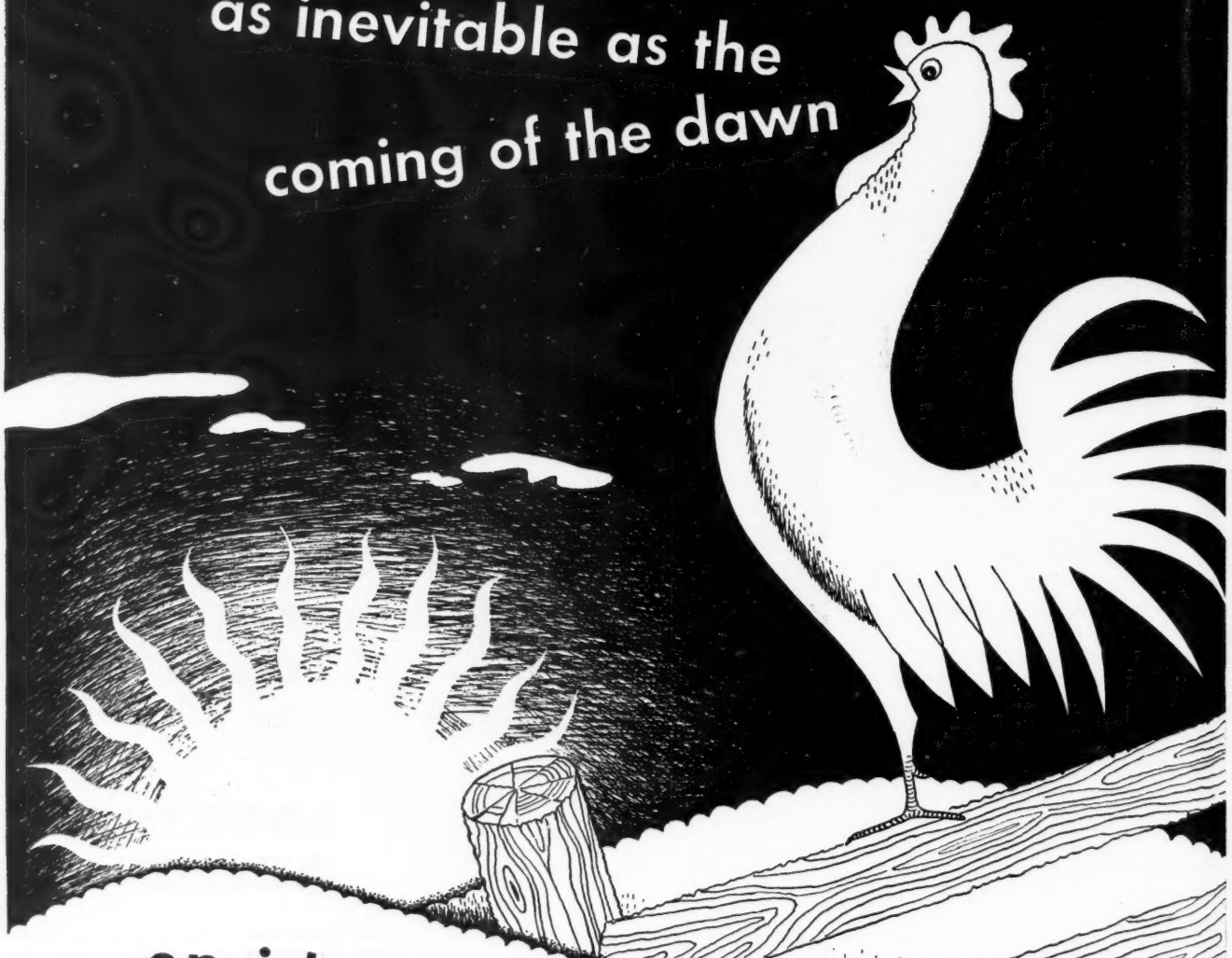
Why not call in a Rossotti Packaging Man for a constructive discussion of your individual requirements? Or drop us a line at our North Bergen Plant. No obligation at any time.

ROSSOTTI LITHOGRAPHING COMPANY, INC.
NORTH BERGEN, NEW JERSEY

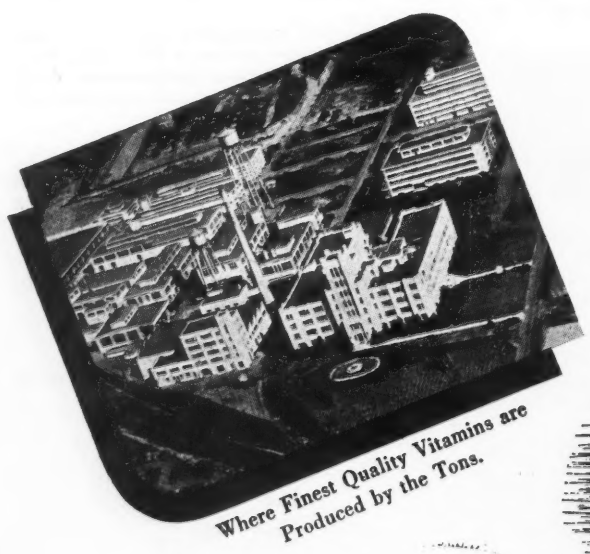
West Coast Division
Rossotti West Coast Lithographing Corporation
San Francisco, Cal.

Sales Representatives in Principal Cities

as inevitable as the coming of the dawn



. . . enrichment of more processed foods



Where Finest Quality Vitamins are Produced by the Tons.

Consult one of the world's largest makers of vitamins—Hoffmann-La Roche, Inc., Roche Park, Nutley 10, N. J. Address: Vitamin Division.

ROCHE

FOOD INDUSTRY NEWS

THE PROCESSING PICTURE

Bakery Engineers Plan For Higher Quality

Training programs recommended. Use of milk and vitamin enrichment stressed. Army bread cited

THE need for careful planning to insure a postwar future while meeting present-day production demands was emphasized during the 21st annual meeting of American Society of Bakery Engineers, March 6 to 9, in Chicago. Interest in such an integrated program was shown by the "standing-room-only" attendance at the sessions.

As a warning, even to those whose plants are operating at peak production, John T. McCarthy, president of the American Bakers Association, emphasized the importance of training bakery personnel by means of visual education, and he also advised training the personnel in the psychology of handling people. Educational programs to supply highly trained executives was another suggestion. This might be done through courses established in universities. These courses would lead to degrees in science, engineering or business administration but would pay particular attention to specific problems of the baking industry.

Advice on Enrichment

Better understanding of the value to the baking industry of the use of milk and of vitamin and mineral enrichment is needed. Wartime practices that have eliminated peacetime wastefulness and unnecessary costs must be retained. The industry must recognize the public interest in basic foods and strive to increase both the nutritive and economic values in bakery products by balancing formulas, using high-quality ingredients, employing carefully planned production methods and practicing systematic plant maintenance.

The point was made in the discussion of current problems that while 4 percent is set as the maximum content for milk solids in bread and rolls, there is no minimum requirement. It was recommended that, rather than stint on the amount of milk in milk breads, ingenuity be used to develop non-milk breads wherever possible and that full amounts of milk be used in the milk breads. The use of milk alternates involves the addition of sugar or diastatic malt to compensate for the absence of fermentables in the substitutes or stretchers. The composition requirements for a postwar loaf were given as 5 percent sugar, 4 to 5 percent shortening, 6 to 8 percent milk solids and adequate quantities of salt based on flour weight in doughs. Particular stress was put on the evaluation of flavor and eating qualities. The Army loaf was cited as a bread of good eating quality and one that should be considered for its postwar possibilities. Bakers might even give serious thought to the use of live dried yeast in an Army-type loaf.

Restrictions To Be Eased

Government plans for the immediate future release of strategic materials were discussed by Walter H. Dietz, Chief, bakery section, distribution operations division, grain products branch, War Food Administration. Since bakery production has increased nearly 40 percent, speedy handling of petitions for replacement is of increasing importance. The policy of WPB will be to release restrictions gradually, but as rapidly as conditions permit. Metals will continue to be allotted to manufacturers on a quota basis.

No reductions in bakery machinery quotas during the year are contemplated. During 1943 only 30 percent of the base year's production of bakery equipment was manufactured, and since 84 percent of the base year's production has now been allotted for the year ending Sept. 30, 1944, it is considered that ample provision has been made for an adequate supply of equipment for the baking industry, provided critical components and the needed manpower are available.

New Officers

The following officers were elected for the 1944-45 term of office: president, Albert J. Faulhaber, American Stores Co., Philadelphia; first vice-president, Guy T. Shiverdecker, Dayton Bread Co., Dayton, Ohio; second vice-president, Henry P. Montminy, Lever Brothers Co., Cambridge, Mass.; secretary-treasurer, Victor E. Marx, American Dry Milk Institute (re-elected).

Food Machinery Eased By New WPB Order

ICE CREAM making, brewery, winery and beverage machinery may now be manufactured under a mid-March amendment to Limitation order L-292 the overall machinery order. Ice cream making machinery is permitted up to 25 percent of the base period, as is bottling-line equipment. Other items covered in the most recent relaxation of L-292 may be produced at only 10 percent of the base period.

Of greater immediate importance to the food processor is the provision which permits used food processing

OFFICERS OF THE AMERICAN SOCIETY OF BAKERY ENGINEERS

Pictured here are the four men elected to head the American Society of Bakery Engineers at their recent meeting in Chicago. From left to right they are: Albert J. Faulhaber, president; Guy T. Shiverdecker, first vice-president; Henry P. Montminy, second vice-president, and Victor E. Marx, secretary-treasurer.

and canning machinery to be sold without restriction. This applies to the farmers, hotels, restaurants or institutions if they have any surplus shipment to sell. Removal of restrictions on the activities of dealers of used equipment will make it much easier for food manufacturers and dealers alike.

Orville May Heads Chemistry Bureau

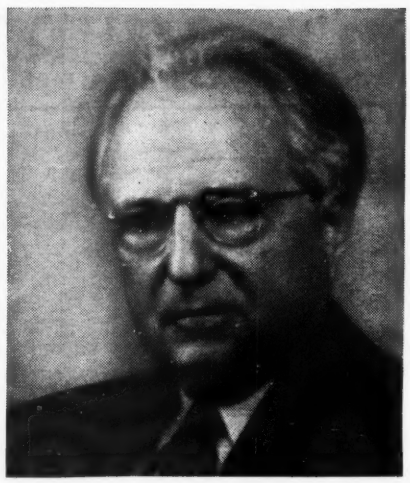
DR. ORVILLE E. MAY has been named chief of the Bureau of Agricultural and Industrial Chemistry of the Department of Agriculture, effective April 1. He succeeds Dr. W. W. Skinner who retired at the age of 70.

Dr. May was educated at Columbia College (Iowa), University of Minnesota, and George Washington University. He has been on the staff of the Bureau since 1923, advancing from a junior chemical position to become Director of the Northern Regional Research Laboratory of Peoria, Ill. He filled that position from its founding until he came to Washington in July, 1942. Most recently he has served as chemical coordinator of Agricultural Research Administration, the administrative agency of which the Bureau is a part.

It is anticipated that Dr. May's designation as chief of the Bureau will result in few fundamental changes, since he has been active in its policy making and administration for a number of years past. His designation as chief is a recognition of outstanding research leadership within the Bureau, and in the coordination of the work of the Bureau with that of other agencies in the Department of Agriculture.

Dr. Skinner, who retired at the age of 70 after 40 years of service in the BAIC, began his bureau service in the old Bureau of Chemistry, as an associate chemist in 1902 and advanced through various ranks in food inspection to the directorship.

ORVILLE E. MAY



W. W. SKINNER

For nearly 25 years Dr. Skinner also served on the board of regents of the University of Maryland and was active in other educational and research fields. For years he served as secretary and later as president of the Association of Official Agricultural Chemists. Dr. Skinner continues in excellent health.

IFT To Meet May 29 to 31

New developments, wartime problems, postwar planning to be discussed at Chicago

THREE different phases of the overall food problem will be covered at the fifth annual meeting of the Institute of Food Technologists, May 29 to 31, at the Edgewater Beach Hotel, Chicago. The opening day's program will review developments since the last IFT meeting at St. Louis, Mo., in June, 1943. The speakers on the second day will concentrate on problems pertinent to the war effort, while the third and final sessions will be devoted to a discussion of immediate future and postwar problems.

Space has been assigned for 30 displays in the exposition to be held in connection with the meeting. Educational exhibits will be set up by the Chicago section of IFT and by the Quartermaster Corps Subsistence Laboratory. The other exhibits will be commercial.

The annual banquet on Tuesday evening, May 30, will be highlighted by the presentation of the Nicholas Appert medal award of the Chicago section to C. A. Browne, United States Department of Agriculture.

Among the speakers scheduled to address the meeting are Maj. Gen. S. G. Henry, director of new developments division, Office of Chief of Staff, War Department; George A. Sloan, president, Nutrition Foundation; S. S. Larmon, president, Young and Rubicam, Inc.; Col. Rohland A. Isker and Capt. W. W. Bailey, Quartermaster Subsistence Research & Development Laboratories; William K. Neuman and Roger Wilson, Continental Can Co. Research Laboratories; Horace L. Smith, Jr., Chain Belt Co.; Roy C. Newton, Swift & Co.; W. V. Sherman, manager, industrial electronics division, Federal Telephone Radio Corp.; William V. Cruess, president, Institute of Food Technologists.

WFA Reports Higher Food Needs in 1944

IN A REPORT on the wartime food situation, WFA estimates that the total requirements for 1944 will be substantially above those of 1943. Meats will be up 6 percent, according to the report, dairy products up 3 percent, edible fats, excluding butter, up 11 percent, eggs up 4 percent, potatoes up 14 percent, canned vegetables up 8 percent and canned fruits up 7 percent.

Foods required for military use and export include: All dried eggs; substantially all dehydrated vegetables; more than half the dried fruit and dehydrated soups; nearly half the canned fruits and canned juices, excluding citrus; nearly half the dry beans; nearly two-thirds the dry peas; about half the rice to be milled; nearly half the cheese; about half the evaporated milk; the larger share of dried milk; one-third of the pork, lamb and mutton; about one-fourth of the beef and one-fifth of the veal.

Except for less butter the civilian allotment about parallels 1943.

Soldiers Prefer Bread From Army Bakeries

BREAD baked in Army bakeries holds a wide edge over commercial bakery bread in the estimation of our soldiers, a recent survey reveals.

The bread eating habit of more than 3,000,000 soldiers in 239 Army posts indicates that the men eat 0.313 lb. per day each when Army bread is served and only 0.280 lb. when given the commercial variety.

A number of reasons are advanced for this preference by officers concerned with Army food service program. All bread produced in Army operated bakeries is made on a stand-

ard straight dough formula, with rigid control maintained over methods of mixing the ingredients, handling the dough, size of the loaf, oven temperatures, baking time and cooling period.

Officials claim that the Army's 20-oz. loaf, known as the garrison loaf is a compact, nutritious and palatable food with superior flavor, texture and appetite appeal, and that from the standpoint of the mechanical factors involved in its production, is easier to produce. In baking a 20-oz. loaf, for instance, the heating system of the oven is not so heavily taxed; cooling of the bread is more rapid and the keeping quality of the bread is better; the 22½-oz. pieces of dough can be handled more satisfactorily at the divider, rounder and proofer than can the larger sizes; and finally, oven capacity for the 20-oz. loaf is about one-fifth greater than for loaves of smaller sizes.

Kills Oleo Restrictions

VIRTUALLY all state restrictions are removed from oleomargarine manufactured from domestic fats in South Carolina, through a bill recently signed by Governor Olin D. Johnston. The new legislation exempts oleomargarine from all regulatory provisions of the South Carolina laws on "imitation butter." A 10 cents a pound tax on oleomargarine manufactured from imported oils is retained, however, as is the requirement for compulsory fortification of the product with vitamin A.

Food Profit Rate Cut As Volume Increases

DESPITE the fact that the dollar volume of 50 representative food processing companies nearly doubled in the past four years, the rate of net profit has been reduced by approximately 35.5 percent during the same period, Paul S. Willis, president of the Grocery Manufacturers of America, declared in releasing the results of a study of 1939-1943 operating figures of these companies.

The rate of net profit per dollar of processed food sales in 1943 was about the same as in 1942, the year in which the General Maximum Price Regulation went into effect, Mr. Willis pointed out. For both years it approximated 3 cents per dollar of sales for the companies analyzed, compared with 4 cents in 1941, 4.6 cents in 1940 and 4.7 cents in 1939.

"Thus, despite paying taxes nearly six times greater than in 1939, besides incurring higher unit costs in producing for swollen military and civilian demands, these food processors carried

"He gets a lift just out of seeing his familiar American label"

These are words of a high-ranking officer who made an extensive tour of the fighting fronts.

Yes, the familiar labels on the cigarettes, candy, chewing gum and other comforts at his PX carry him back to the cherished scenes and friendly faces he's missed for many months . . . It's like meeting old friends thousands of miles from home!

The package goods manufacturers and their material suppliers are doing a splendid job in keeping up a steady flow of these "old friends" for the service men—as well as their folks back home. We who supply them with the wrapping machines needed for high-speed production, are in a position to know what difficulties they have had to overcome.

And though we are chiefly engaged in building equipment for the armed forces, we are bending every effort to meet the needs of package goods manufacturers . . . If you require a machine for wrapping war or essential civilian supplies, call on us. We'll either build you a new machine or help you obtain a used one through our Wrapping Machine Procurement Service.

PACKAGE MACHINERY COMPANY
Springfield 7, Massachusetts
New York Chicago Cleveland Los Angeles Toronto

Just a few of the many products wrapped on our machines.

PACKAGE MACHINERY COMPANY
Over a Quarter Billion Packages per day are wrapped on our Machines

out the Administration's mandate to the OPA to hold-the-line at the level of 1942," declared Mr. Willis.

Sales of these 50 companies in 1943 were estimated at $8,200,000,000 compared with $4,244,510,000 in 1939, according to the analysis. Taxes in 1943, vital to finance the war, were more than five times greater than for 1939. In the latter year they were $50,720,000, and in 1943 estimated at $300,000,000. Both profits and taxes for 1943 were based on actual earning statements for the first nine months of that year, with the last three months estimated.

Net income of the 50 companies after taxes in 1943 was expected to be about $245,000,000 compared with $226,201,000 in 1942; $239,878,000 in 1941, $215,742,000 in 1940 and $197,392,000 in 1939.

More Food Plants Receive "A" Awards

SIXTEEN more food processing plants in six states have earned the War Food Administration achievement "A" award for outstanding performance in food production, WFA announced.

Office of Distribution officials said award presentation ceremonies will be held in the near future at most of the 16 plants. The plants are: Barron-Gray Packing Co., San Jose, Calif.; Exchange Orange Products Co., Ontario, Calif.; Sharp Canning Co., Rockford, Ohio; Stokely Foods, Inc. plants at Greenwood and St. Paul, Ind.; McCormick & Co., Inc., Washburn, Me.; nine Burnham & Merrill Co. plants in Maine and New Hampshire; and Campbell Soup Co., Camden, N. J.

Workers Denied Raise

A REQUEST by the United Cannery, Agricultural, Packing and Allied Workers, CIO, for wage increases at the Chicago, Ill., and Camden, N. J., plants of Campbell Soup Co. has been denied by the National War Labor Board on the grounds that these workers have received all increases allowed under the wage stabilization program.

Cannery Output Drops

PRODUCTION of canned fruits, vegetables, juices, baby foods and soups in 1943 totaled 321,800,000 standard cases, a decrease of 38,900,000 cases compared with the 1942 production. But the total government requirements last year were less—86,100,000 cases as against 113,600,000 cases in 1942. This resulted in a decrease of only 11,400,000 cases in the civilian supply.

DEVELOPMENTS IN DISTRIBUTION

Food Forum Considers Foreign Requirements

DOUBT that the United Nations could fully meet the food needs of liberated Europe and the Far East was expressed by Roy F. Hendrickson, deputy director general of UNRRA, in a talk before the recently organized Food Forum held in Washington, on March 16, this Forum being sponsored by a group of small companies which make or use soya products.

A great deal depends upon whether the German collapse comes before or after planting time, Mr. Hendrickson pointed out, for the widespread destruction that will accompany the German collapse will be most serious if accomplished after planting. In any case, he assured the gathering, the stream of food pouring into these countries would have to be very large for 12 to 24 months after the Axis surrender.

M. Lee Marshall, head of the Food Distribution Administration, told the Forum that American civilians are enjoying greater per-capita supplies of food now than they did during the 1935-39 period. The supplies are also better distributed because of general employment and rationing. Mr. Marshall said that shipments to Britain and Russia in 1944 will amount to less than 8 percent of our total supply. A big percentage of our shipments to these countries have been in the protein foods including meat, dried eggs, milk, cheese, canned fish, beans, peas and soya products.

The allocation system during the post-war period will function much as it does now, in Mr. Marshall's opinion. This system will guarantee to Americans a diet that is based on the standards of good nutrition and it will guarantee to the hungry people of other countries that we will help them as much as we can in the light of our own needs and resources.

While the original sponsors of the food forum are interested in low-cost protein foods, the group invites discussion of other food groups that can contribute to the slogan they have adopted — "Freedom from hunger, health for the future." This first meeting, addressed as it was by prominent members of the administration, was attended by a large representation from Congress as well as by members of the industry.

OPA Sees No Need for Upping Milk Prices

THE substantially increased payments to dairy farmers, now being made by WFA, will render unnecessary broad-scale or area milk price increases, Price Administrator Chester Bowles has announced.

After reviewing the increased rates of payment, Mr. Bowles said that the new rates will enable milk producers generally to meet increases in production costs which have occurred since the dairy payment plan was initiated on October 1, 1943.

Dry Skim Milk Name Changed by Congress

THE long-time effort of Dried Milk Institute culminated on March 2 in the signing by the President of Public

British-Combine

FOOD FOR THE FAMISHED

British Army trucks bearing the sign "Food for the People" are an increasingly common sight in the famine stricken province of Bengal, India. Acting in cooperation with the Bengal government, the British army is playing a notable part in relieving famine conditions, and at the same time is building good will for England and the allied nations. The picture shows coolies loading trucks with sacks of grain.

CANDY FOR WASTE PAPER

The Curtiss Candy Co., of Chicago, threatens to corner the waste paper market in the Windy City by offering a candy bar to every youngster who brings a bundle of paper weighing more than ten pounds. In this picture, Edwin V. Zeddies, vice-president and general sales manager is "paying-off" some hard working collectors.

Law 244: "To fix a reasonable definition and standard of identity of certain dry milk solids." The purpose of this act is to eliminate the requirement previously imposed by the Food and Drug Administration that this commodity be called "dry skim milk." The new law says:

"For the purposes of the Federal Food, Drug and Cosmetic Act of June 26, 1938, nonfat dry milk solids or defatted milk solids is the product resulting from the removal of fat and water from milk, and contains the lactose, milk proteins and milk minerals in the same relative proportions as in

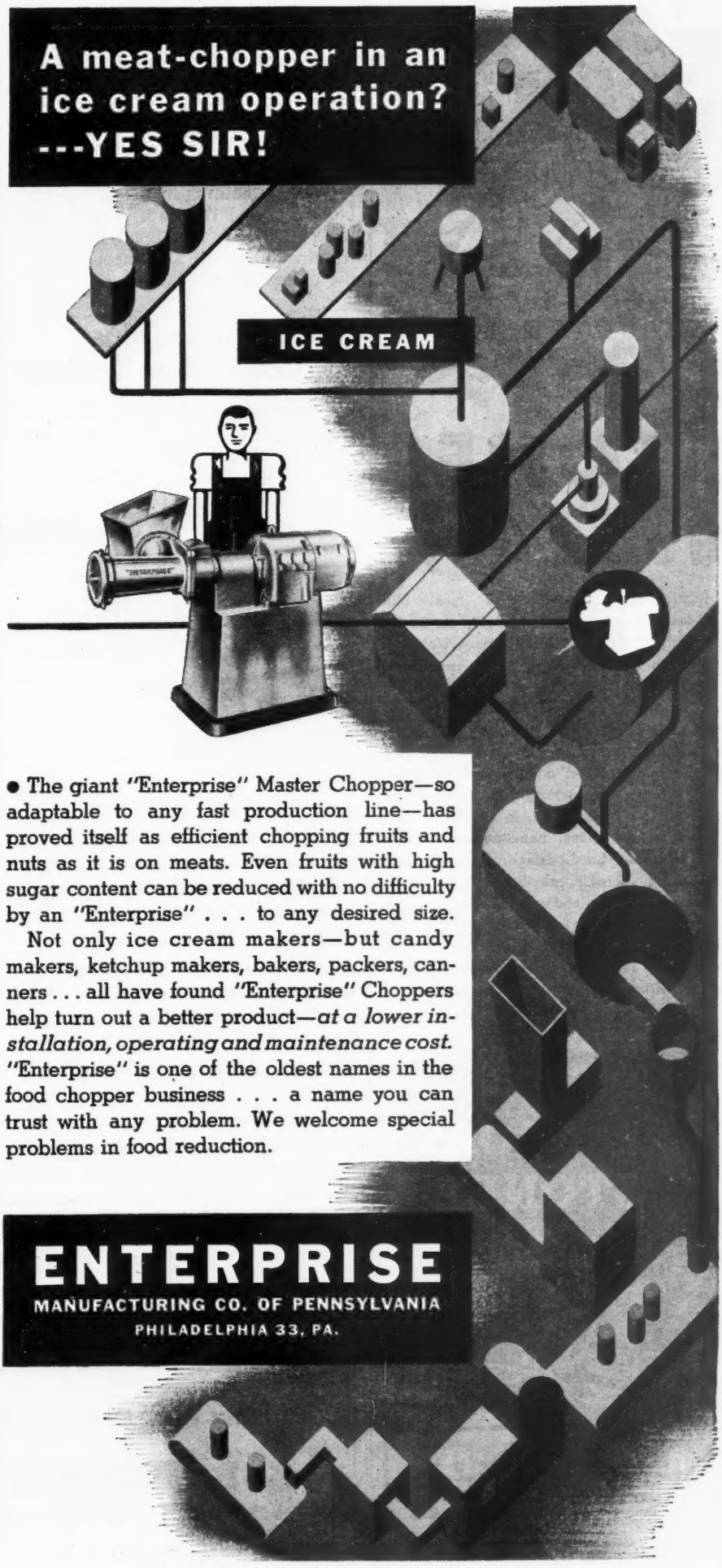
SCHEDULE OF EVENTS

APRIL

3- 4—Tri-State Packers Association, annual spring meeting, Lord Baltimore Hotel, Baltimore, Md.
3- 7—American Chemical Society, agricultural and food division, Cleveland, Ohio.
17-18—Southern Bakers Association, annual meeting, Bon-Air Hotel, Augusta, Ga.

MAY

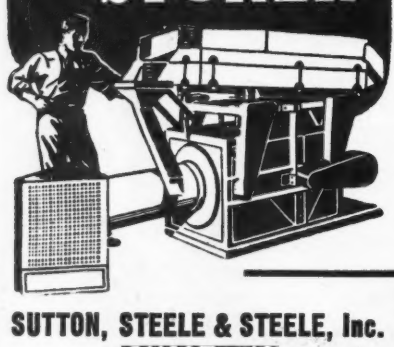
3- 5—Society of American Bacteriologists, annual meeting, Hotel Pennsylvania, New York City.
10-12—American Oil Chemists Society, 35th annual meeting, Hotel Roosevelt, New Orleans, La.
15-16—American Society of Brewing Chemists, second wartime meeting, Edgewater Beach Hotel, Chicago.
21-22—National Association of Flour Distributors, annual convention, Hotel Carter, Cleveland, Ohio.
22-23—Associated Retail Bakers of America, war conference, Hotel Sherman, Chicago.
22-23—Flavoring Extract Manufacturers Association of the United States, annual meeting, Hotel New Yorker, New York City.
23-25—American Association of Cereal Chemists, Hotel Nicollet, Minneapolis, Minn.
29-31—Institute of Food Technologists, fifth annual meeting, Edgewater Beach Hotel, Chicago.


A meat-chopper in an ice cream operation? ---YES SIR!
ICE CREAM
• The giant "Enterprise" Master Chopper—so adaptable to any fast production line—has proved itself as efficient chopping fruits and nuts as it is on meats. Even fruits with high sugar content can be reduced with no difficulty by an "Enterprise" . . . to any desired size.
Not only ice cream makers—but candy makers, ketchup makers, bakers, packers, canners . . . all have found "Enterprise" Choppers help turn out a better product—at a lower installation, operating and maintenance cost. "Enterprise" is one of the oldest names in the food chopper business . . . a name you can trust with any problem. We welcome special problems in food reduction.
ENTERPRISE
MANUFACTURING CO. OF PENNSYLVANIA
PHILADELPHIA 33, PA.

STONES
Good Buy!

Costly and wasteful are most mill processes for "stoning" cereals, soy-beans and other dry-processed foods. Now, at relatively small investment, the process is stream-lined, costs cut to a fraction of old, laborious, hand or semi-hand picking methods. To eliminate this great headache of the cereal and other dry food processors, we have developed a new type stoner—revolutionary in design, amazing in efficiency, low in first cost, in operation. Removes stones, glass, non-magnetic metals, and all other hard, dangerous contaminations from cereals, soy-beans, and other beans, and other food products, with, 1) an action so sensitive the tiniest particles are easily removed; and 2) operating cost so low it is relatively insignificant; and 3) 99.9% efficiency. Capacity up to 16 tons per hour. Write for Bulletin FI-444.

S S & S
AIR-FLOAT
STONER



SUTTON, STEELE & STEELE, Inc.
DALLAS, TEXAS
In Canada — Kip Kelly, Ltd., 68 Higgins Ave., Winnipeg
Foreign — Separations Engineering, Ltd., 133 Bush House, Aldwych, London

the fresh milk from which made. It contains not over 5 percent by weight of moisture. The fat content is not over 1½ percent by weight unless otherwise indicated. The terms milk, when used herein, means sweet milk of cows."

There is nothing in this act to forbid the use of the term "skim," and it seems certain that Food and Drug Administration will still encourage the use of that term.

Freezer Space Must Come From Coolers

No expansion of cold storage facilities is contemplated by government officials. There is still some conversion of cooler space to freezer space now being carried out, and further projects will receive the fullest cooperation from the Office of Defense Transportation. Shortage of materials, manpower and equipment are reasons enough for this policy, but, ODT officials have also stated that there is enough cold storage warehouse space available in the country although there may have to be some juggling of the space to make it go around.

At the present time there is no difficulty in securing repair and maintenance items. Compressors and other machines used in refrigeration equipment, however, are among the tightest of components and the erection of new cold storage plants will not be permitted.

RAW MATERIALS REVIEW

Less Sugar Available For Food Processors

THERE is nothing encouraging in the outlook for sugar, either in the immediate or the near future. The immediate outlook is a reduction of about 6 percent in the allocation for civilian uses in 1944, which explains the cut in allotments to food processors. The total allocation for all civilian uses this year is 5,074,906 short tons, raw basis.

Part of the sugar shortage grows out of the industrial alcohol program. But that is not the only cause. Last year the U. S. beet sugar crop was a disastrous failure, being 700,000 tons, or 40 percent short of normal. Then Puerto Rico's current production will be off 25 percent, a loss of 250,000 tons. And Hawaii is suffering from a shortage of sugar machinery and labor.

The longer range world outlook is not bright, what with Java and the Philippines in the hands of the Japanese and the vast Russian sugar industry damaged by the Nazi invasion of the Ukraine. These three areas normally produce 5,000,000 tons.

Lard Now Plentiful

LARD has been scratched off the list of critical fats. There is so much in storage that allocations for civilian use were increased by 50,000,000 lb. for the first quarter of the year, all of it becoming available last month. And not only has OPA reduced the ration point value to zero, but WFA is advising bakers to use more lard as a substitute for vegetable shortening.

Sugar Quotas Cut Except for Bakers

THE sugar quotas for all industrial users in the food field, except bakers and manufacturers of bakery type products, which include breakfast cereal and cereal paste products, were reduced from 80 to 70 percent of their

BASIC FLAVOR MATERIALS

ESSENTIAL OILS • WHOLE AND GROUND SPICES

ARTIFICIAL MAPLE BASE

OLEO RESIN PARSLEY SEED • OLEO RESIN CAPSICUM

S. B. PENICK & COMPANY

IMPORTERS • CHEMICAL MANUFACTURERS • MILLERS

50 Church Street, New York, 7, N. Y. COrtlandt 7-1970

735 W. Division Street, Chicago, 10, Ill. MOHawk 5651

base period use by Amendment 4 to OPA revised ration order No. 3.

The amendment, which became effective March 13, permits the baked goods manufacturers to continue using 80 percent of the base period use. The cut was necessary, says OPA, to keep the total sugar use within the current quarterly allocation of WFA.

In determining where best to make the reductions, consideration was given to the efforts of WFA to encourage the consumption of cereals and grain.

Most Spices Available In Adequate Quantity

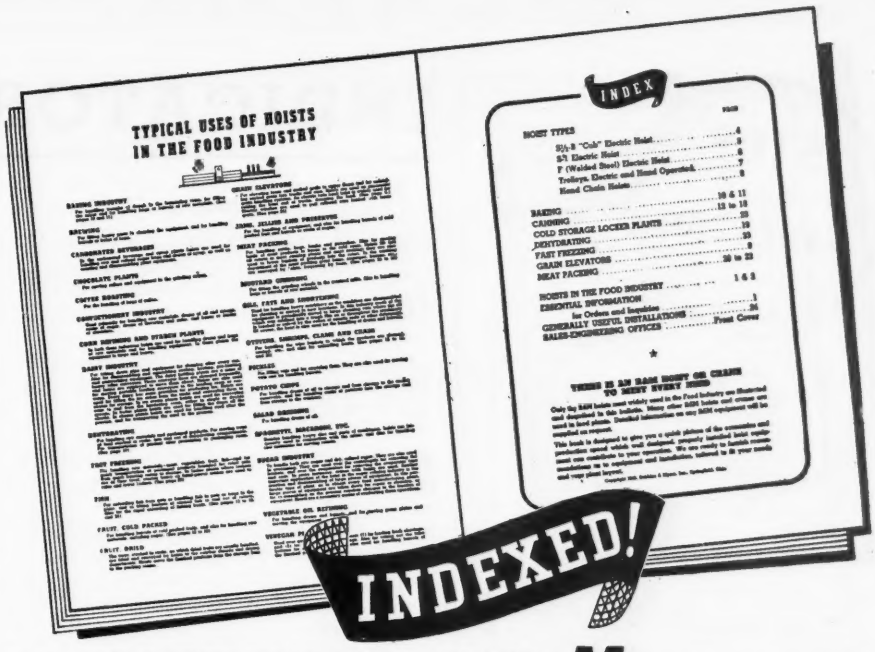
THERE is good reason to believe that the quantity of most spices on hand will be adequate for normal civilian consumption in this country for the duration, the WFA reports. Low prices and large crops in the countries where important spices are grown encouraged importations in excess of normal for several years preceding the war. The situation is so favorable that the distribution of larger supplies of nutmeg and mace has been recommended by the Spice Industry Advisory Committee. And recent arrivals of cloves, the first in over a year, have built up inventories to the point where cloves soon will be marketed without restrictions. The same will be true of pimento (allspice), following a very favorable crop and relatively large imports.

First Hybrid Onion

THE first hybrid onion variety has just been released to growers by the California Agricultural Experiment Station and the U. S. Department of Agriculture under the name "California Hybrid Red No. 1." It is described as "very mild, very sweet, and exceedingly high-yielding."

Buys More Materials For Alcohol Making

NEGOTIATIONS have resulted in an elaborate purchase contract between the government and representatives of Cuba for molasses supply during the rest of this year. About 800,000 short tons of raw sugar as invert molasses and 65 million gallons of blackstrap will provide much of the needed raw material for industrial alcohol works in the eastern United States. Curtailment of alcoholic beverage making in the Islands and restrictions on imports into the United States may result in somewhat greater molasses supply, all of which may be taken for the government alcohol program.



TO INCREASE YOUR *Manpower*

GRAIN ELEVATOR MEN
How to rapidly load and unload trucks, barges. Storage methods simplified, speeded. Rush-season efficiency—off-season economy. Page 9.

BAKERS
How to speed dough mixing, dividing, packaging. Installation assistance based on wide knowledge of bakery requirements. Pages 10 and 11.

CANNERS
How to boost peak-season output. More production per retort or fewer retorts for equal output—lower fixed costs. Pages 12 to 18.

DEHYDRATORS
How to handle product from raw-material to packaged stage simply and quickly. Make the most of your manpower. Page 19.

MEAT PACKERS
How to boost production per square foot of floor space with fewer men. Cut handling cost per pound. Pages 20 to 22.

LOCKER MEN
How to get economical, efficient, single-unit service for both fast-freeze compartments and storage lockers. Page 23.

Let R & M Hoist Bulletin 830 help you with your material-handling problems. Learn how you can speed production, release manpower for other vital work.

Check all operating details that long experience has shown to be suitable for conditions inherent in the food industry. Long periods of operation, moisture, use by inexperienced workers, and risk of product spoilage all create problems that R & M Food Hoists meet and master.

Write today for your free copy of Bulletin 830 . . . or consult your nearest R & M Distributor below.

SPECIAL R & M FOOD HOIST DISTRIBUTORS

A. K. Robins & Co.....Baltimore
Berlin Chapman Co.....Berlin, Wis.
Food Machinery Corp....Harlingen, Texas
F. H. Langsenkamp Co.....Indianapolis
Robert W. Taylor Co.....San Francisco
Sprague-Sells Div., Food Machinery Corp. .....Hoopeston, Ill.
Dunkley Co.....Kalamazoo, Mich.
Chisholm-Ryder Co.....Niagara Falls
James Q. Leavitt Co.....Ogden, Utah

ARMY E NAVY

ROBBINS & MYERS • INC.
HOIST & CRANE DIVISION • SPRINGFIELD, OHIO
In Canada: Robbins & Myers Co., of Canada, Ltd., Brantford, Ont.
MOTORS • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878

The CONFUSED FLOUR BEETLE

He's just a simple-minded bug. But he and his close relative, the rust red flour beetle, are about the worst insect pests of prepared cereal foods. They have a taste for other things as well —grocery products, peas, beans, nuts—even mustard and cayenne pepper! Oftentimes they leave a peculiar smell to the flour on which they feed.

FUMIGATE

Properly applied HCN gas is an effective fumigant for control of this and other insect and animal pests. Call on your local Pest Control Operator for a well-planned fumigation program.

We have a book containing interesting information about pests and their control by fumigation. Just drop us a line on your letterhead and we will be glad to send you a copy. E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington, Delaware.

DU PONT
REG. U. S. PAT. OFF.
CYANEGG
REG. U. S. PAT. OFF.
AN ECONOMICAL SOURCE
OF HCN FUMIGATING GAS

INDICATORS

Production

Sauerkraut packed in tin and glass, exclusive of bulk, amounted to 2,730,716 cases for the 1942-43 season, National Canners Association reports.

Lima beans packed during the past season totaled 1,864,080 cases of all sizes, according to National Canners Association.

Flour production dropped off 748,000 sacks in February compared with the previous month, but was considerably higher than in February, 1943. Figures compiled by *The Northwestern Miller*, and representing 73 percent of total output, give the February, 1944, production as 14,208,757 sacks.

Butter, creamery, produced in January, 1944, amounted to 105,400,000 lb., down 14.4 percent over the January output in 1943.

Evaporated milk produced in January, 1944, totaled 194,500,000 lb., 5 percent less than in the corresponding month a year earlier.

Tomato juice pack in 1943 totaled 19,251,559 cases, National Canners Association reports. The pack last year was higher, being 20,738,394 cases. These figures include the packs of tomato juice and tomato cocktail.

American cheese production during January was estimated at 44,500,000 lb., 3 percent less than in the same month a year ago but still 38 percent over the ten-year (1933-42) January average of 32,205,000 lb. While production is increasing rapidly, the gain compared with December was not as sharp as a year earlier.

In Storage

Butter, creamery, in cold storage was reduced during February by about 22,800,000 lb. to a holding of 107,467,000 lb. as of Mar. 1, 1944. Of this amount, Dairy Products Marketing Association and WFA owned 74,500,000 lb. This indicates net withdrawals of WFA stocks during February of approximately 13,000,000 lb. Total holdings on Feb. 1, 1944, were 130,246,000 lb., and the five-year average (1939-43) holdings on March 1 are 40,726,000 lb.

Fruits, frozen, in storage on Mar. 1, 1944, totaled 186,844,000 lb., as compared to 145,272,000 lb. on Mar. 1, 1943, and to a 1939-1943 average of 122,069,000 lb. for the date.

Vegetables, frozen, in cold storage amounted to 153,762,000 lb. on Mar. 1, 1944, as against 74, 821,000 lb. on Mar. 1, 1943, and a 1939-1943 average for the date of 65,670,000 lb.

Tea stocks in this country at the end of 1943 were estimated by the Tea Bureau at 23,294,000 lb. This is an increase of 1,100,000 lb. over stocks for Dec. 31, 1942.

Poultry, frozen, in cold storage dropped a little from the 239,993,000 lb. on Feb. 1, 1944, to 220,404,000 lb. on March 1. The holdings last March 1 were 101,741,000 lb.; the five-year (1939-43) average is 141,026,000 lb.

Meats (frozen and cured) and lard in cold storage on March 1 reflected a continuance through February of the heavy accumulations on hand in January. Beef stocks increased by 34,800,000 lb., pork by 146,000,000 lb., trimmings and offal by 8,400,000 lb. and lard and rendered pork fat by 106,200,000 lb.

Cheese, American, in cold storage on Mar. 1, 1944, was up to 144,700,000 lb. from the February 1 figure of 142,610,000 lb. A year ago there was only 76,678,000 lb. in storage and the 1939-43 average for March 1 is 91,842,000 lb.

Raw Materials

Eggs, liquid, produced in January, 1944, for immediate consumption, drying and freezing, totaled 71,370,000 lb., 68 percent more than in January last year. Production for immediate consumption was 2,202,000 lb.; for freezing, 11,796,000 lb.; for drying 57,192,000 lb. In addition, 22,595,000 lb. of frozen eggs (from storage) was used for drying.

Eggs dried in January totaled 21,565,000 lb., compared with 12,000,000 lb. for last

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York, N. Y.
Director of Circulation:
Please change my address on "Food Industries"

From.....

.....

To.....

.....

Signed.....

CONSTRUCTION NEWS

	Pending (thousands)	Awarded March (thousands)	Total Awarded 1944 (thousands)
Bakery	$40	.....	$80
Beverages	120	.....	.....
Canning and Preserving	40	$40	40
Cold Storage	345	136	326
Confectionery	.....	.....	.....
Grain Mill Products	150	.....	.....
Ice Manufactured	.....	.....	40
Meats and Meat-Products	80	140	180
Milk Products	842	170	608
Miscellaneous	1,395	40	120
	$3,012	$526	$1,394

January. Of this quantity, 21,409,000 lb. was dried whole eggs, 59,000 lb. dried albumen and 97,000 lb. dried yolk.

Eggs dried in 1943 (revised figures, amounted to 261,972,000 lb., consisting of 252,903,000 lb. of whole, 2,093,000 lb. of albumen and 6,976,000 lb. of yolk.

Livestock on farms on Jan. 1, 1944, was as follows: cattle, 82,192,000 head; milk cows, 27,607,000; sheep, 51,718,000; hogs, 83,756,000; chickens, 572,460,000; turkeys, 7,520,000. For January, 1943, these were the figures: cattle, 79,114,000 head; milk cows, 27,106,000; sheep, 55,775,000; hogs, 73,736,000; chickens, 540,798,000; turkeys, 6,704,000.

Cocoa imports have continued heavy. From the first of the year to March 8 arrivals totaled 732,947 bags. Imports for the same period a year ago were 524,944 bars. Licensed warehouse stocks, however, had declined to 40,792 bags, compared to 65,520 bags on hand a year ago.

Beet sugar production for the 1943-44 season amounted to 18,621,690 bags, according to Meinrath Brokerage Co. This is a tremendous drop from the production of 32,319,404 bags a year earlier.

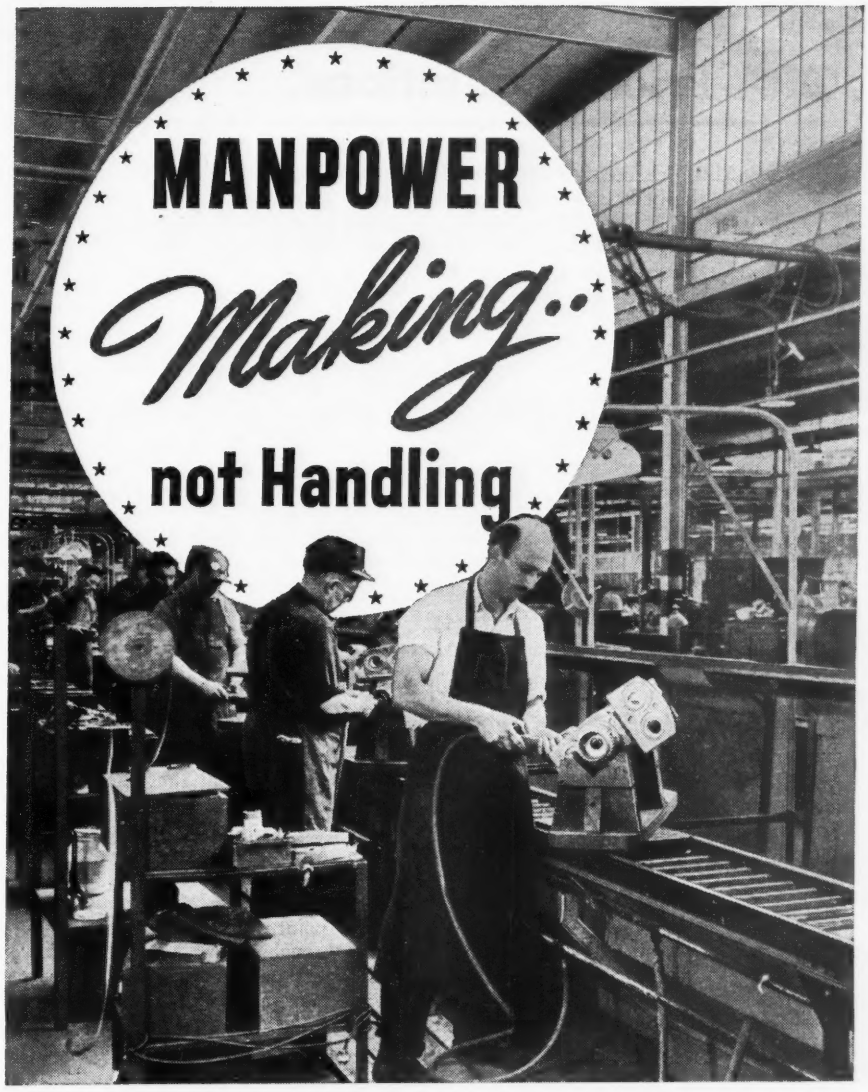
Indexes

Food commodity price index of the *Journal of Commerce* stood at 104.5 on March 11, as against a February average of 107.3. There has been a downward trend in the past year, the average March, 1943, index being 113.5.

Wholesale commodity price index for foods, compiled by Irving Fisher, was 120.6 on Mar. 17, 1944, compared to 121.0 a month earlier and 120.9 a year ago.

Cost of living index of National Industrial Conference Board stood at 103.4 in February, very slightly below the 103.9 January figure and higher than the 101.9 index for February, 1943.

Business activity index of *Business Week* was up to 239.7 on Mar. 16, 1944, compared to 239.0 a month earlier and 229.7 a year ago.



..... Elimination of fetch-and-carry methods increases output, lowers costs, and speeds delivery

ARE you satisfied with your present material handling methods? How long has it been since you have checked the flow of materials to spot bottlenecks that reduce output?

Every unnecessary minute spent *handling* material adds to costs and delays delivery. In plant after plant, essential products are being turned out with record-breaking speed, because Standard Conveyors have been engineered and installed to do the handling part of the job.

Why not call on Standard for a checkup of your conveyor system? It will cost you nothing and will not obligate you in any way.

Time-saving and cost-cutting equipment installed for today's wartime job is an investment in postwar profits.

Write for helpful reference book—
"Conveyors by Standard"
—Catalog No. FI-44.

STANDARD CONVEYOR COMPANY
General Offices:
NORTH ST. PAUL, MINN.
Sales and Service In Principal Cities

★ ENGINEERED FOR FASTER PRODUCTION ★

OPA Price Regulations

Powdered Milk—An increase of 1½ cents per pound in the bulk sales price of roller process powdered milk and buttermilk is authorized by Amendment 27 to MPR 289, effective February 26. The increase was permitted to correct the price relationship between roller dried and spray dried milk.

Fruits and Vegtables—Maximum prices established for the 1943 fruit and vegetable pack will also apply to fruits and vegetables packed up to the time that a 1944 pricing regulation is issued. The action embodied in Amendment 27 to MPR 306, is taken to clear up confusion and especially to provide a ceiling for vegetables of the 1944 crop, such as snap beans, beets and tomatoes, which are now being packed in Texas and Florida.

Processed Apples—Processors who use glass applesauce, apple juice and sweet cider containers for the 1943 pack of apples, may increase their maximum prices by 20 cents per dozen above ceilings for the products packed in equal sized tin cans, according to Amendment 6 to MPR 493, effective March 4.

Soybeans—Fulfillment of contracts for soybeans of the 1943 crop entered into before February 24 is permitted by Amendment 1 to MPR 515 issued March 2. The CCC requested this action because the purchase and storage of soybeans by a few processors had been encouraged. The prices in the contracts involved may exceed the maximum price originally set.

Damaged Food—When damaged meat fats or processed foods are sold or transferred to insurers or salvagers, both the seller and the buyer are to report the transfer within five days, according to Amendment 15 to Rev. RO 13 and Amendment 111 to RO 16, both effective March 10. The move is aimed at preventing damaged foods from getting into illegitimate channels.

Sweet Potatoes—Until a program of flat pricing of the 1944 crop of sweet potatoes can be worked out, the maximum prices for all sellers will remain at the levels at which they were frozen last December. The action is embodied in Amendment 2 to MPR 376, effective March 2.

Cheddar Cheese—An increase of 3.8 cents per pound in the ceiling price of natural or processed Cheddar cheese sold to war agencies is allowed to manufacturers and authorized assemblers by Amendment 28 to MPR 289, effective March 1. The increase provides for the recapture of subsidy payments previously made.

Amendment 26 to the same regulation makes some major changes in the price regulations of Cheddar cheese, while it clarifies and makes simpler the method of determining maximum prices. The maximum price at the manufacturer's level is increased by ¼ cent per pound for the following types: single daisies, longhorns, young Americas, picnics, midgets, square prints, natural loaf, and smaller sizes. The assembling allowance is reduced by ¼ cent per pound as is the price for packages weighing more than ½ lb.

Processed Foods—A complete list of the reports, records and registrations required of persons dealing in processed foods is contained in Amendment 10 to Rev. RO 13. Published in two parts, the first part summarizes the records that wholesalers, retailers, processors, industrial users and certain consumers must keep of their inventories, transfers and use of processed foods. The second part tells who must register under the processed foods order and what reports such registrants must make to the OPA.

The inventory factor for processed foods, for the period April 2 to April 29, will be 4, according to Amendment 4 to Second Revised Supplement 1 of Rev. RO 13. This factor is the same as that used in the previous period, but the base months are December, January and February.

Corn—Amendment 1 to Second RMPR 346 limits the use of formula prices to setting maximums for corn locally produced at any point, rather than for corn shipped to or through a point from other areas, and it supplies methods of determining maximum prices for corn to be removed by barge. The amendment is effective February 21.

Milk—Regional administrators of OPA are empowered, by Amendment 41 to MPR 280, to impose maximum price control upon inter-handler sales of fluid milk first physically received at a plant within the jurisdiction of the regional administrator. This is a change in jurisdiction where more than one area is involved in a transaction.

Cottonseed and Soybean Oil—The maximum prices set for cottonseed and soybean oil from the 1943-44 crops also apply to oils made from subsequent crops, according to Amendment 17 to MPR 53, effective February 26.

The ceiling price for soybeans that are to be processed for oil was set by MPR 515, effective February 24.

Cucumbers—Ceiling prices which restore the normal differential that hot-house cucumbers have enjoyed in the past over field-grown cucumbers are set by Amendment 20 to MPR 426, effective February 21.

Canned Pork Sausage—A price of $33.25 per hundredweight for the sale of canned pork sausage to the armed forces is set by Amendment 15 to RMPR 148, effective February 24. The limitation on the volume of sales of fabricated pork cuts to purveyors of meals is eliminated by the same amendment, and several definitions are clarified.

Packed Vegetables—Provisions for differential pricing of certain container sizes of asparagus, snap beans and miscellaneous vegetables not previously priced in this manner are added to MPR 306 by Amendment 26, effective February 18. Originally, the regulation provided specific dollars-and-cents maximum prices, varying by geographical area, for asparagus and snap beans.

Cheese Manufacturers—Cheese manufacturers and all other primary distributors who operate under RO 16 may register their branch plants and other establishments as a group when substantially all the operations of the group are directed by a central control office. The regulation, embodied in Amendment 105 to RO 16, effective February 19, permits such group registrations even though the central office was set up after March 29, 1943, the previous deadline.

Peanut Oil—New maximum prices for refined peanut oil are from 0.01 to 0.31 of a cent per pound higher as formulated in Amendment 16 to MPR 53, effective February 21. The increases were allowed because the half-cent-per-pound subsidy paid to refiners last year by CCC will not be paid on the 1943-44 crop.

Meat Cuts—Provisions in the regulation controlling dollars-and-cents maximum prices for sales of fabricated lamb and mutton cuts to ship operators are temporarily revised by Amendment 12 to RMPR 239, effective March 21. The revisions parallel those made applicable for sales of beef and veal cuts to ship operators, issued under Amendment 37 to RMPR 169, effective February 19.

Grapefruit Juice—The price reductions which processors must make on government sales of grapefruit juice packed between Oct. 1, 1943 and Jan. 31, 1944, were announced on March 14. These reductions have no effect on sales to civilians.

Enriched Flour—The ceiling price on all enriched flour, both for use by bakers and by the consuming public, is reduced by 5 cents per 100 lb., by Amendment 2 to RMPR 296, effective March 18. Retail prices will be reduced by the same amount where the processor is now selling at his ceiling price.

Eggs—New schedules of maximum prices for both frozen and dried egg products, for the remainder of 1944 and January and February, 1945, are embodied in Amendment 24 to MPR 333, effective March 4.

Amendment 25 to the same regulation sets flat maximum prices for wholesale grades of shell eggs to cover the period from March 6 to May 27. This amendment was effective March 6.

Dried egg products processed in accordance with new and experimental specifications for the Quartermaster Corps are exempt from price control by Amendment 23 to the above MPR.

Ice Cream—Maximum prices now in effect for ice cream and ice cream mixes are ex-

tended to May 23 by Amendment 43 to MPR 280, effective February 23. This is the fifth extension of the temporary price-adjustment provision originally issued on Feb. 22, 1943.

Beef—Beef set-aside requirements will be extended, beginning April 1, to packers who in the past have not been operating under Federal inspection and who slaughter weekly 52 or more cattle that produce "Army style" beef. Army style beef is defined as dressed steer carcasses weighing 400 to 1100 lb. or dressed heifer carcasses weighing between 350 and 650 lb. and grading U. S. Choice, Good, Commercial or Utility.

WPB Orders

Vitamin A—Restrictions on the delivery and use of vitamin A are outlined in M-373, issued February 28. The order applies to those receiving more than 500,000,000 USP-XII units during any calendar month. This order fails to define the method to be used in determining the vitamin A content.

Container Machinery—All deliveries of new and used container machinery, including that used for packaging and labeling, can closing, can making, glass jar and bottle making and cleaning or reconditioning, are restricted to orders bearing an AA-5 rating or better by L-332, effective March 1.

Glass Containers—The 1944 quotas for new glass containers for nonalcoholic beverages are set at 80 percent of the number accepted by the packer in 1941 by an amendment to L-103-b, issued February 19. For malt beverages, the quota is 100 percent of the number of returnable bottles accepted in 1943 and for wines and distilled spirits, 100 percent of the number used in 1943.

Refrigeration—If a new air-conditioning or refrigeration system has been authorized under L-38, and authorization to construct has been granted under L-41, a repairman may use up to $250 worth of material, purchased under Controlled Materials Plan 9A, to install the new system.

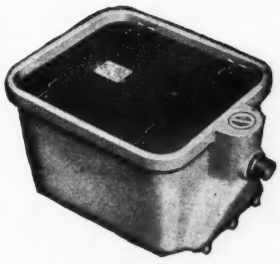
Laboratories—Conditions under which priority assistance is given to laboratories are clarified in P-43 as amended. The term "laboratory" is also defined in the order, as are the conditions under which the AA-1 preference rating may be used.

Waxed Paper—All types and grades of waxed paper other than household packages and wrappings for direct military use are under end-use control regardless of the method of production, according to Interpretation 1 to M-241-a.

Processing and Packing Machinery—The quota percentages covering gross tonnages of controlled materials that manufacturers may use in the production of meat canning, processing and packing equipment,

"IT'S THOSE DRAINS AGAIN! THE BEST WAY I KNOW TO KEEP THEM CLEAR IS WITH ZURN GREASEPTORS"
"O. K. THEY WILL SAVE US MONEY, AND THE GREASE THEY RECOVER WILL HELP TO MAKE WAR EXPLOSIVES."
Prevent Costly Drain Clogging .... And Help Blast the Axis

There's "Dynamite" in Waste Grease Separated and Recovered at Drain Entrances with the



ZURN Duraclay* GREASEPTOR

Makeshift grease traps, seldom adequate, often prove to be costly substitutes when drainage lines become clogged. Zurn Greaseptors are scientifically designed to function efficiently in the interception of grease and fats which cause costly clogging of pipes if permitted to enter sewerage lines. Zurn Greaseptors intercept, separate and recover grease and fats from waste water by the "flotation" principle. They offer the most effective and most convenient manner of recovering grease and keeping it from accumulating in pipes where it inevitably causes costly trouble.

Your plant maintenance man or plumbing contractor can easily connect Zurn Greaseptors to drainage lines adjacent to sinks and other fixtures, either on top or below the floor.

There's a wide variety of styles and sizes, ranging from 12 to 25 gallons per minute and with fat retention capacities up to 55 pounds.

Avoid costly drainage troubles and save much-needed grease for the making of war explosives. Send coupon below for new descriptive booklet.

Zurn Greaseptors are approved under War Department Specification for Theater of Operations (Modified) and Mobilization Construction Equipment, PE-620.

J. A. ZURN Mfg. Co. *Sales Office and Factory,* **ERIE, PA.**

*Crane Co. Trade Name

ZURN BUILDING • PLUMBING DRAINAGE PRODUCTS

J. A. ZURN MFG. CO., Dept. FI, Erie, Pa. U. S. A. Form 44-36

Please send New Booklet on Zurn Greaseptors.

*Name*_____

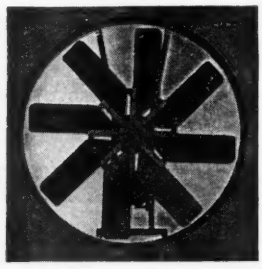
*Firm*_____

*Address*_____

*City*_____ *State*_____

(Please attach to your business letterhead)

INSURE FUTURE DELIVERY
. . . by placing orders NOW
for Coolair TRADE MARK



EXHAUST FANS
for SCIENTIFIC VENTILATION

While WPB Regulations do not permit us to accumulate a warehouse stock of Coolair Fans, our plant has been able, up to now, to make reasonably prompt shipment on all priority rated orders, but . . .

Because this favorable situation may not prevail at the time you plan to install Coolair Fans in your plant we suggest that you figure out the number of fans you will need to solve your ventilating and cooling problems and place orders now while the necessary materials and supplies are still available for manufacture.

CATALOG PAGES
Fan models, dimensions and performance data can be found
in SWEET'S
ASHVE GUIDE and
ELECTRICAL BUYER'S
REFERENCE

Should CMP Regulation 5 not cover your requirements, file form PD-1A with your nearest WPB Field Office. All orders must bear a priority rating of AA-5 or better.

AMERICAN COOLAIR CORPORATION
"Pioneer Manufacturers of V-Belt Drive Exhaust Fans"
3604 Mayflower Street Jacksonville 3, Florida

FREDERICK PUMPS

GUARANTEED
to meet the conditions
for which they are sold

SPECIALLY DESIGNED FOR EFFICIENT SERVICE IN THE FOOD INDUSTRIES

Made by specialists who are thoroughly familiar with operating conditions, Frederick Pumps are available in the types, materials and sizes best suited to your needs.
Write for full details—no obligation

THE Frederick IRON & STEEL CO.
Frederick, Maryland

and those covering flour, grain, feed milling and processing machinery and equipment are set by schedules VI and VII, which are contained in amendments to L-292. Both schedules are based on the average annual tonnage of controlled materials used by these manufacturers during 1939-41. The production period runs from Oct. 1, 1943 to Sept. 30, 1944. For meat processing machinery and equipment 125 percent of the period is permitted; flour and milling machinery manufacturers are permitted 100 percent for general reduction machines, 140 percent for grinders, 90 percent for mixing and feeding machines, 110 percent for sifting and screening, 100 percent for cleaning and grading, 90 percent for general conditioning equipment, 90 percent for filter and press and 85 percent for all other types of machinery and equipment. These schedules do not cover orders for export outside the United States and Canada, or for direct use by the Army, Navy, Maritime Commission or the War Shipping Board.

WFA Orders

Sugar—Civilians have been allotted 2,351,462 tons of sugar for the January to June period, and the total civilian allocation for 1944 is 5,074,906 tons, raw basis, a reduction of about 6 percent below the total consumed in 1943.

Eggs—The shell-egg support prices for the period ending April 15 were announced by WFA on February 29. Up to that date nearly 4,000,000 cases of shell eggs had been purchased, according to the announcement, under the support plan.

Prices for which offers of dried whole eggs will be considered are graduated as follows: $1.15 for the period April 1 to June 30; $1.18, July 1 to July 31; and $1.21, August 1 through August 31.

Farm Products—The 1944 schedule of support prices for farm products is summarized in an announcement issued by WFA on March 4. The schedule is made effective as a result of the action of Congress which made provision for carrying out the program. It is designed to assure farmers of receiving the prices necessary to produce the needed foods and to protect canners against the possibility of inventory losses.

Raisins and Currants—Further restrictions are placed on the use of 1943 crop raisins and Zante currants by prohibiting their sale for conversion into alcohol, brandy, wine or any other beverage, as well as any concentrate, any sirup, or any other product or byproduct except as directed by WFA. These restrictions are contained in an amendment to FDO 17, effective March 4.

Canned Fish—Canners of fish must continue to file weekly and seasonal reports during the packing season, March 1, 1944, to Feb. 28, 1945, as stipulated in an amendment to FDO 44-1. Salmon canners may exempt chum and steelhead

from such reports, as these species have been removed from government set-aside restrictions. Shrimp canners also are exempted from reporting requirements.

In Amendment 2 to the same order, canners are required to set aside 60 percent of their pack of each species of salmon, except chum and steelhead, and 45 percent of the packs of pilchards and of Atlantic and Pacific mackerel.

Orange and Grapefruit Juice—Canners are required by an amendment to FDO 22.5 to increase the set-aside of canned grapefruit juice from 38 to 41 percent and that of canned orange juice from 42 to 48 percent. A WFA announcement of March 17 said the increase will go to the armed forces.

Milk Products—Domestic sales of all products made by drying milk or milk mixtures, except infant foods and products made exclusively from skim milk, buttermilk or whey, are restricted on a percentage basis, by FDO 93, in order to divert milk from these products to commodities which are suitable and vitally needed for war export. These preferred commodities include dried skim milk, high-quality dried whole milk, butter, Cheddar cheese and evaporated milk.

Dried Fruits—Packers who set aside their total production of dried apples and Zante currants for government use, under FDO 16, are now authorized to release 3,568,000 lb. of dried apples and close to 1,000,000 lb. of currants to the civilian market through regular trade channels. WFA, in an announcement made February 25, said the release of these fruits was made possible by a change in the war requirements.

Cheese Assemblers—The conditions under which cheese assemblers will be authorized to handle Cheddar cheese set aside for delivery to government agencies has been revised in Amendment 2 to FDO 15. Assemblers authorized under FDO 15 before February 29 will have to obtain new authorizations.

The set-aside quota on Cheddar for April is 55 percent. Although this quota represents a 25 percent increase over January and February, the quantity for civilian consumption is expected to be about the same as in recent months.

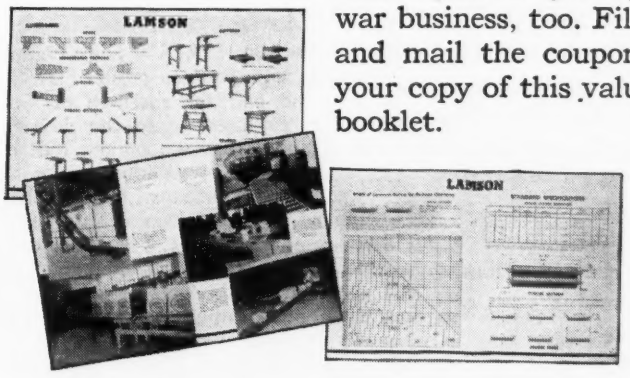
Fish Oil—WFA announced the termination of FDO 59 on March 1. The order required the setting aside of crude fish oil, and had been in effect since July 1, 1943.

A quantity of reserves of fish oil will be released on the tenth of each month from March through June. All fish oil released will be subject to the use or allocation limitations of FDO 60.

Spices—Cloves and pimento (all spice) are withdrawn from quota restrictions, and quotas on mace and nutmeg are raised, by amendment to FDO 19.2 effective as of January 1. Greater supplies of these spices as a result of improved shipping led to the amendment, which leaves unchanged the quotas on black and white pepper, cassia (cinnamon) and ginger.

THIS BOOK ★ ★ ★ ★

TELLS YOU . . . how to move your products faster, more efficiently, more economically. In war-busy food warehouses and processing plants, Lamson Roller Gravity Conveyors are eliminating waste motion, adding to the productivity of manpower, reducing costs, and providing better control of stock. Let us show you how Lamson Roller Gravity Conveyors can take an active part in your post-war business, too. Fill out and mail the coupon for your copy of this valuable booklet. ★ ★ ★ ★ ★ ★ ★ ★



LAMSON CORPORATION
Syracuse 1, N. Y. ★

Please send me free copy of booklet describing Lamson Roller Gravity Conveyors.

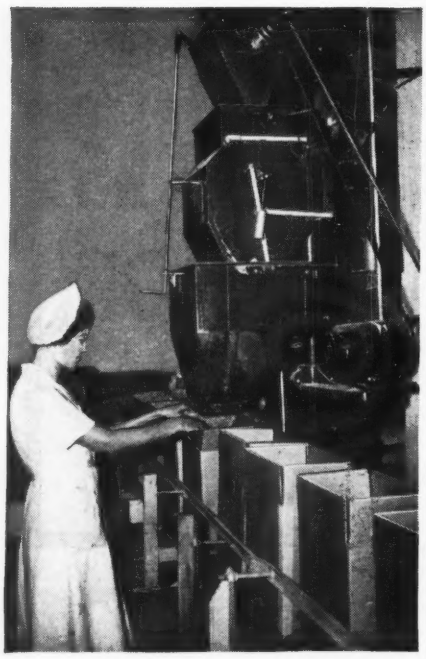
Name ..... Position .....

Company .....

Address ..... State .....

Because of the demand for this booklet it can be sent only to those who name their company and position.

LAMSON CONVEYORS



You Can Weigh Dehydrated Vegetables ACCURATELY with this Automatic Machine!

MODERN, sturdy construction provides the stamina that enables this efficient weighing and packing unit to give dependable, continuous service, day in, day out, as required for war food production.

Correct, modern design provides the flexibility that enables these units to be used on many food products, ranging from fine powdered soup mixes to dehydrated potatoes, beets, onions, cabbage, etc., in weights up to 25 pounds per discharge.

Edtbauer-Duplex Weighers bring speed of packaging, accuracy and dependability to your wartime food production line.

Complete information on request.

EDTBAUER
Duplex Automatic Weighers

Made by

B. F. Gump Co

Established 1872

454 S. Clinton Street, Chicago 7, Illinois

MAKERS OF: Equipment for Grinding, Sifting, Mixing, Feeding and Weighing of Dry Food Products.

CAPITAL VIEWS

"SURPLUS" FOOD—Goods and factories owned by Uncle Sam are becoming surplus as changing war conditions modify the demand at the military front. Plans for surplus disposal are therefore extremely important. The report by Elder Statesman Baruch sets a pattern which will probably govern for several years in its major characteristics. That plan calls for the disposal of surplus food through War Food Administration under a general policy fixed for all goods. However, the facts are that there is likely to be very little surplus food. And it is still more likely that any temporary surpluses of most basic foods will be used for relief or Lend-Lease purposes. American food manufacturers are therefore not confronted with the threat of competition from Uncle Sam's excess supplies which seriously threaten in other manufacturing industries.

IMPORT VERSUS EXPORT—Figures released during March indicate that food imports are now substantially greater than at any previous time during the war period. Public purchases of foodstuffs for import during 1943 amounted to $133,000,000. Even those food manufacturers which are not getting all of the imported raw materials that they wish can now expect to get increased imports, except where the primary source is still in Axis control. Returning ship space provides fair opportunity for this movement from most parts of the world. But of course exports through Lend-Lease and UNRRA still far exceed imports, either present or prospective.

FOOD OR TIRES—Again Washington must choose between greater sugar supply for food and the speed-up of synthetic rubber for tires. Again the decision has been to use about a million tons of raw sugar through invert molasses for alcohol with which to make synthetic rubber. Decisions of this character are essentially political at this time. The degree of "political" scarcity is gaged by the degree of public demand. And the noise about more tires seems to be greater than the clamor for more sweetener.

SMALL COMPANIES FIRST—Where limited quantities of scarce raw materials can be assigned to industry for processing there is a tendency to encourage small-company operation. This philosophy is leading to decisions that may see reestablishment of many small local enterprises in manufacturing business ahead of the time when big firms can get back on to normal manufacturing bases. It remains uncertain whether this theory will go so far as to encourage establishment of new small companies. As yet the effect has been only to reestablish on a normal basis a few old firms which had been pinched off or much restricted during the war period. In any event, it is now worthwhile for the ambitious small operator to seek a foundation for postwar business. Washington, with its strong antimonopoly leanings, can be counted on for help.

FOOD OR FEED—Last month we commented on the orders to restrict beet molasses use for food purposes wherever possible. Now we find that further pressure to promote materials from feedstuffs to foodstuff is being made by restricting container usage. Where a material can be a food it may not be canned as feed, even as pet food, under certain circumstances. As a consequence, meals for the pup become increasingly difficult.

RACE DISCRIMINATION—An increasing number of new cases of claimed discrimination in employment because of race, creed, color or national origin are being considered by the President's Committee on Fair Employment Practice. Much less than 10 percent of the total number of cases require formal action, but the activity stirred by zealots, those with political motive, and those sincerely interested in fair employment is so great as to cause serious concern among Washington observers.

Those who appear to be taking a constructive part in this matter are urging that employment officers of industry go out of their way to avoid the appearance of discrimination, even while they are being careful not to mix personnel in such a manner as to interfere with war production.

Lately this problem has been greatly aggravated by political considerations in Washington. Some of the executive officers have seriously offended Southern members of Congress by what seem like silly and indiscreet actions. As a consequence, FEPC may be abolished by congressional action. But the need for eliminating unfair discrimination still continues, despite the trouble stirred up through over-zealous or misguided support of negro interest.

JAPANESE LABOR—Many of the crops for food processing were grown in the West with the aid of Japanese labor in prewar years. Many of the present farm problems are being solved in part by controlled import of Mexican and Caribbean labor. It takes no soothsayer to recognize that these conditions will not continue long in the postwar period. No industrial management should count on getting raw material grown with the assistance of such non-American employees. There is sure to come a day of unemployment in which both organized and unorganized labor will make its wishes felt against the use of these foreigners. The mechanization of agriculture must be planned so that raw materials for food processing can be had practically without "stoop" labor. That is an ideal not easy to reach, but one likely to be forced on our industries.

REEMPLOYING VETERANS—About a million men and women will be discharged from the military service during 1944. A majority of these will be released without permanent physical handicap. The personnel department of any firm that is still seeking more employees can well contact the nearest USES on this subject. Where

there are openings for workers who have a slight permanent handicap, it is worthwhile also to consult the American Red Cross workers at nearby hospitals where veterans' discharge occurs. Theoretically USES knows of all the candidates for employment. But many such veterans go needlessly far from the hospital of discharge to find work. Actual placement of handicapped veterans is done by Red Cross workers in the veterans' hospitals. And those skilled specialists in handling the problem welcome information as to real jobs to which they may direct those ready to be released from medical care. Some of these discharged persons are very seriously handicapped nervously even when otherwise physically fit. But many are fully employable and should be given the chance to go to work as soon as possible.

JAR SIZES—The new standard-size containers which provide a Victory model for many foods are greatly encouraging the tendency toward reduction in many sizes of containers used for these foods. Already postwar plans are being made for food packaging in many research and merchandizing departments. It is well that these departments consider whether they will not retain these standard sizes regardless of the choice of distinctive package characteristics in other particulars. Where they have once been adopted, there are going to be embarrassing criticisms if any companies later go back to odd fractional sizes. Not the least of the embarrassment will come from the charge of "short measure." And it will not make much difference whether there is any justification for such charge or not. The embarrassment will be there just the same.

MORALE BUILDING—The War Department believes that many factory workers will better appreciate their responsibilities if they know the worst about the dangers at the fighting front. To bring these facts home to civilian "soldiers" there have been prepared new motion pictures which can be shown wherever there is interest in them. Any factory management which would like to build employee morale by this means should communicate with the Industrial Services Division, Bureau of Public Relations, War Department, Washington, D. C. Movies gladly will be furnished for this purpose.

ADVERTISING CHALLENGED—Federal Trade Commission proceedings have been started against Colgate-Palmolive-Peet Co. demanding a change in the advertising practices of that firm. It is charged that the advertising has "misrepresented" the goods sold. If the Commission can make its plans stick, it proposes to go into the courts and compel the elimination of all the charm and distinctive service claims which have been commonly associated with toiletries, cosmetic materials, and other such products. The whole matter is significant also for food industries because this is only one symptom of the trend at FTC toward domination of all merchandising practices, including censorship of the text of advertising "copy."

The man in control... Few products are manufactured under such close, scientific controls as fine chemicals — yet even here the human element is important.

That's why *every* batch of *every* Monsanto food flavoring chemicals is *double* checked in the control laboratory before a single pound leaves for your plant. And that's why *every* Monsanto control chemist is carefully trained in the latest analytical techniques.

The skill and knowledge of these men are your guarantee of *controlled* quality in *every* shipment you receive from Monsanto. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, St. Louis, Mo.
District Offices: New York, Chicago, Boston, Detroit, Charlotte, Birmingham, Los Angeles, San Francisco, Montreal, Toronto.

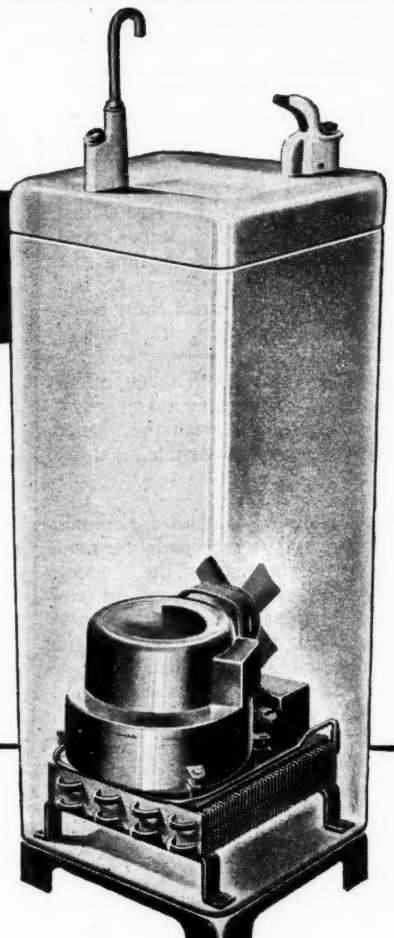
MONSANTO CHEMICALS

Monsanto Flavoring Chemicals of *Controlled* Quality
Vanillin Monsanto — Methyl Salicylate Monsanto
Ethavan (Ethyl vanillin) — Coumarin Monsanto

SERVING INDUSTRY. . . WHICH SERVES MANKIND

★ALL-PURPOSE ENGINEERING

. . . in Universal Cooler Post-War Hermetic Refrigerating Units will set New Standards of Adaptability and Performance



Apparent at once is the unusually low, compact, modern design of the new post-war hermetics by Universal Cooler. Not visible to the eye, but vitally important, is the *All-Purpose Engineering** built into these outstanding refrigerating units.

Designed to perform more efficiently . . . to meet a wider, more versatile range of requirements than ever before . . . Universal Cooler's complete post-war line includes basic, field-tested models which can be exactly tailored to *your* requirements, whatever they are.

"Let's Ask Universal Cooler"

At Universal Cooler, greatly expanded testing and research engineering staff and facilities are at your service . . . now. You are invited to "make our plant your laboratory" . . . to bring us your refrigerating problem in its entirety. Write today for the book, "Refrigeration Is Our Business," which gives a complete picture of Universal Cooler Engineering and Production facilities!

ALL-PURPOSE ENGINEERING is the art of making a thing in simplest form for the widest possible range of applications and/or conditions.

Example: In the Arctic, rubber packing for shock absorber struts on U. S. Army planes froze and cracked, but leather worked fine. In the tropics, rubber was OK, but leather was unsatisfactory. So Army engineers designed a combination rubber-leather packing that performs satisfactorily anywhere on earth. That's *ALL-Purpose Engineering!*

In refrigeration, Universal Cooler leads the field in applying *All-Purpose Engineering.*

UNIVERSAL COOLER

WE SELL TO MANUFACTURERS ONLY

UNIVERSAL COOLER CORPORATION • Automatic Refrigeration since 1922

MARION, OHIO • BRANTFORD, ONTARIO

MEN • JOBS • COMPANIES

INDUSTRY

Altrusa Packing Co.'s warehouse at Fort Meade, Md., has been destroyed by fire with a loss estimated at $40,000.

Armstrong Creamery Co., Wichita, Kan., plans to erect a dairy plant building which will cost $50,000, including the equipment.

Buckeye Sugar Co., Ottawa, Ohio, has purchased the Ohio Sugar Co. in Ottawa. The plant includes a large alfalfa dehydrating mill and a fertilizer mixing plant. The company intends to start contracting sugar beet acreage as soon as provisions of the Federal beet sugar program are released.

Beatrice Creamery Co. is continuing with its expansion program by acquiring South Side Consumers Dairy Co., St. Louis, Mo. and Independent Creamery & Ice Cream Co., Los Gatos, Calif. Both are dairy and ice cream plants.

John H. Dulany & Son, Fruitland, Md., has completed the construction of an eight-section storage warehouse which is capable of curing and storing 112,000 bu. of sweet potatoes packed in bushel baskets.

Knudsen Creamery Co. is planning the construction of a new processing plant at San Bernardino, Calif. The plant will permit pasteurizing, homogenizing and bottling of milk locally.

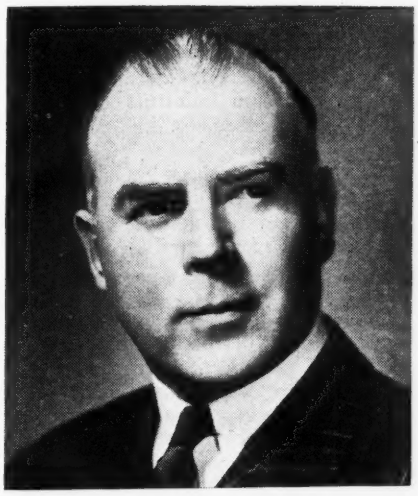
Lakeshire-Marty Co., Plymouth, Wis., has purchased Valley House cheese factory in Plymouth, as a research center, in which to carry out scientific studies of cheese production.

Lakeview Dairy, Inc., and Glen Dairy, Inc., both in Richmond, Va., have been bought by **Hugh N. Rakes,** owner of 5,500 acres of dairy farms.

National Dehydrators' Association has launched a $75,000 research program to look into the postwar development of home markets. The association is also moving its headquarters from Washington to Chicago.

Pacific Northwest Wine Association, which is composed of all major wineries in Oregon, Idaho and Washington, has been newly organized to foster the development of the Pacific Northwest wine industry. Fred W. Wonn, Seattle, Wash., has been named president of the association.

Pangburn Candy & Ice Cream Co., Fort Worth, Tex., has elected I. C. Parker, president and general manager of the company.



HENRY W. RODEN

American Home Products Corp., Jersey City, N. J., has elected Henry W. Roden, president of Harold H. Clapp, Inc., a subsidiary company, a vice-president of the organization, in charge of a newly formed food division. Three food companies—Harold H. Clapp, Inc., G. Washington Coffee Refining Co. and P. Duff & Sons, Inc.—will be included in the new division. He will also continue as president of the Clapp company in New York as well as Harold H. Clapp, Ltd. of Canada.

R. P. STRAKA

Formerly in charge of the poultry section for Western Regional Research Laboratory, Albany, Calif., R. P. Straka has been promoted acting chief of the Commodity Processing Division of the laboratory, succeeding H. C. Diehl, who is now director of Refrigeration Research Foundation. As a member of the Food Research Division of the former Bureau of Chemistry and Soils, Mr. Straka was among the first research men to have an active interest in the freezing preservation of vegetables.

Ross Packing Co., Selah, Wash., manufacturer of dehydrated potatoes and apples, has been awarded the Army-Navy "E" flag for excellence in production.

Sheffield Farms Co., Inc., New York, has purchased Sanitary Milk Products Co., Peru, Ind. The Peru plant has facilities for processing milk and cream and other dairy products. Sheffield Farms will use the plant chiefly to supplement its present manufactured milk lines.

RALPH DULANY

Ralph Dulany, president of John H. Dulany & Son, Fruitland, Md., and prominent in the canning and freezing industry, has been elected president of National Frozen Food Packers Association.

Shreveport Macaroni Mfg. Co., Shreveport, La., has been damaged by fire with a loss of approximately $25,000.

Sunshine Packing Corp., Northeast, Pa., is planning the construction of a fireproof addition to its plant, which is estimated to cost about $100,000.

PERSONNEL

Shell R. Clevenger of Bush Bros. & Co., Dandridge, Tenn. and J. Paul Craddock, Bardwell Canning Co., Bardwell, Ky., have been appointed 1944 president and vice-president, respectively, of the Tennessee-Kentucky Canners Association.

C. D. Freeze has been named assistant to J. B. Pardieck, president of California Vegetable Concentrates, Inc., Huntington Park, Los Angeles.

James F. Hale, former production superintendent of Deerfield Packing Corp., Bridgeton, N. J., and more recently a consultant in quick-freezing and dehydration technology, has gone with Container Corp. of America.

VODOL

THE STABLE
EDIBLE PHOSPHATIDES
DERIVED FROM CORN OIL

•

"COMMERCIAL LECITHIN"

•

EMULSIFIER

•

ANTIOXIDANT

•

Prevents Flavor Reversion of Refined SOYA Oil

REFINING, UNINCORPORATED

SALES OFFICE
219 East North Water Street
CHICAGO, ILLINOIS
Telephone - Superior 1280

LECITHIN HEADQUARTERS of AMERICA

LECITHIN
for
FOOD
AND
TECHNICAL
PRODUCTS

•

ROSS & ROWE, INC.

75 Varick St. New York 13, N. Y.
Wrigley Bldg. Chicago 11, Ill.

SOLE SELLING AGENTS
FOR
AMERICAN LECITHIN CO.

Grant H. Hartman has been promoted to the office of personnel manager for Sheffield Farms Co., New York. Mr. Hartman has held supervisory positions in pasteurizing and bottling plants in the city and recently has been in charge of the quality control program at Sheffield Farms.

Carl A. Hedreen, formerly research and development manager for Canadian Fishery Co., Vancouver, B. C., Canada, is now manager of Ocean Industries Laboratory, South San Francisco, Calif.

George N. Hopfenbeck has been elected vice-president of Colorado Milling & Elevator Co., Denver, Colo. He was formerly treasurer of Union Securities Corp., New York.

Joseph P. King has been appointed personnel manager of the eastern production division of Birds-Eye-Snider operation of General Foods Corp. Prior to joining General Foods, he was regional farm manpower director for New York State under the War Manpower Commission.

C. H. Lowry, operator of canning plants at Gibson City, Ill. and Straughn, Ind., has purchased Crites Milling Co., a corn canning plant at Tuscola, Ill.

J. Stuart McGrath, who has been on leave of absence from Armour & Co., for the past year, as district meat rationing representative for OPA, has resigned to become manager of Armour's Grand Rapids branch.

R. B. Murphy, who has been with Nesbitt Fruit Products, Inc., Los Angeles, Calif., packer of fruit juices, sirups and bases for beverages, for 20 years, has been elected president of the company.

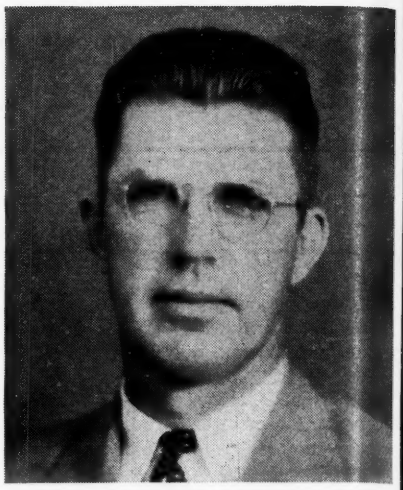
Leslie R. Olsen has resigned his position as director of products control for International Milling Co., Minneapolis, Minn., and plans to enter the Army.

Thomas Oxnard has been named president of Savannah Sugar Refinery, Savannah, Ga., succeeding the late Benjamin O. Sprague. William W. Sprague becomes executive vice-president.

M. E. Parker, who recently resigned as manager of production for Beatrice Creamery Co., Chicago, Ill., plans to investigate the possibilities of establishing a food industries service organization in sanitary practices and quality control.

George N. Pfarr plans to retire, on May 1, as general manager of Tri-Valley Packing Association, San Francisco, Calif. He will be succeeded by Philip Marks. Mr. Pfarr organized the association in 1932 and will continue to act in an advisory capacity. He has been actively connected with the California canning industry for the past 21 years.

Elmer T. Stevens, president of Chas. A. Stevens & Co., Chicago, has been elected to the board of directors of Wilson & Co., meat packers.



ROBERT E. EVANS

Robert E. Evans has been appointed secretary-manager of Florida Citrus Commission, succeeding Marvin H. Walker, who has resigned. Mr. Evans has been closely associated with the citrus industry in Florida since 1930. Prior to his appointment with the Commission, he was chief of the fruit and vegetable division of FDA in Atlanta, Ga., directing the work for the region which included nine southern states.

Herman L. Wente, well-known to the wine industry, has been elected to his second term as president of the Wine Institute, San Francisco. Other officers re-elected to serve during 1944 were J. B. Cella, John B. Ellena and Edmund A. Rossi, first, second and third vice-presidents, respectively.

Clyde Wilson, former plant manager of the preserve department of Squire Dingee Co., Chicago, has recently retired from his position. Mr. Wilson has been with Squire Dingee for the past 18 years.

Walter R. Zwoyer and Rudolph J. Kampner have been elected directors and assistant vice-presidents of Henry Heide, Inc., confectionery manufacturer.

DEATHS

D. S. Binnington, 42, a member of the research staff for General Mills, Inc., Minneapolis, Minn., recently.

Maurice W. Boyer, Sr., 62, president and general manager of Phenix Pabst-ett Co., Chicago, a subsidiary of Kraft Cheese Co., March 6, in Chicago.

C. F. Brown, 87, founder and former president of Southern Molasses Co., New York, March 7, in Winter Haven, Fla. Mr. Brown was credited with being the first to market molasses in cans.

William G. Dickinson, 59, general manager of the Chicago division of Durkee Famous Foods, recently, in Calif. Mr. Dickinson had been with Durkee for 14 years.

David R. Dreyfus, 74, retired candy manufacturer, recently, in Montgomery, Ala.

Edward G. McDougall, 68, former president of Libby, McNeill & Libby, Chicago, March 9, in Chicago.

Leroy S. Palmer, 56, prominent dairy scientist and chief of the division of agricultural biochemistry of the Department of Agriculture at the University of Minnesota, March 8, in Minneapolis, Minn.

A. W. Smith, 67, secretary-treasurer of Security Biscuit Co., February 27, in Salt Lake City, Utah.

Gross T. Williams, 54, president of Consolidated Biscuit Co., Chicago, recently, in Phoenix, Ariz.

ASSOCIATED INDUSTRIES

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has set up a new Basic Industries department which will correlate the activities of departments which had formerly been independent units. The new department includes the flour milling and oil extraction division, crushing, cement and mining machinery division and the saw and pulp mill division.

Chemicolloid Laboratories, Inc., New York, has signed a royalty agreement with Girdler Corp., Louisville, Ky., and is manufacturing the Pferrer Girdler premier tank, starch cooker and starch cooler.

Dow Chemical Co., Midland, Mich., has developed a new product, Propylene Glycol, N. F., which can be used as a flavoring vehicle and as a plasticizer and chemical intermediate for food processing.

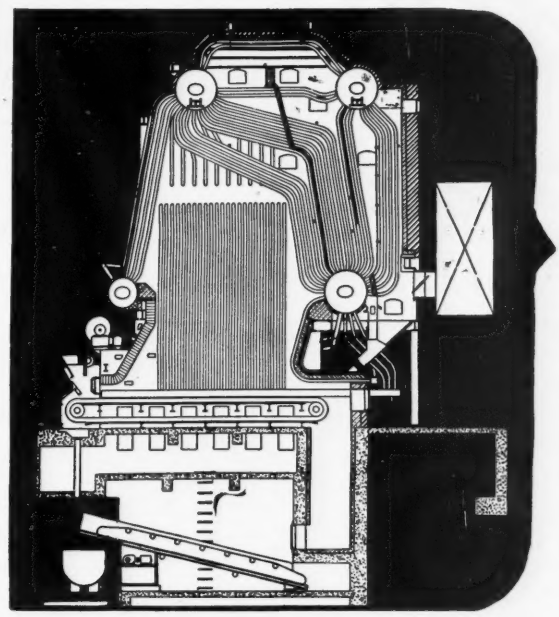
Monsanto Chemical Co., St. Louis, Mo., has entered the West Coast industrial field through the acquisition of I. F. Laucks, Inc., Seattle, Wash., manufacturing chemists and leading producer of plywood glues. No changes in the Laucks operating personnel have been made.

Frank D. Palmer, Inc., Chicago, and the Riverside, Calif., plant of Food Machinery Corp., have been awarded the Army-Navy "E" for excellence in production. Bristol Co., Waterbury, Conn., has been presented its first renewal star for the "E" pennant. Jenkins Bros. and Handy & Harman plants in Bridgeport, Conn., have been given their fourth Army-Navy "E" award and Buffalo Pumps, Inc., North Tonawanda, N. Y., has been granted a third star.

H. K. Porter Co., Inc., Pittsburgh, Pa., has entered the freight car manufacturing field and has expanded its process equipment division by purchasing Mt. Vernon Car Mfg. Co., and its subsidiary, J. P. Devine Mfg. Co., Inc., both with plants in Mt. Vernon, Ill.

UNION

FILE THESE UNION ADS FOR REFERENCE



H-TYPE
A-TYPE
RADIANT TYPE
L-TYPE
4-DRUM
O-TYPE
LONG DRUM
CROSS-DRUM
UNIVERSAL STEEL-CASED
UNIVERSAL BRICK-SETTING
HORIZONTAL RETURN TUBE
LITTLE GIANT
HEATING

RADIANT TYPE

THIS is a patented 4-drum boiler design that doubles the usual radiant exposure found in 4-drum boilers. This Union front wall radiant element, together with the main tube bank, form an "A" shaped roof over the fire. This added radiant exposure, by absorbing fully ten times more B.T.U.'s per sq. ft. than the blind or convection heating surface, provides faster steaming, greater capacity, lower furnace temperatures and maintenance, and lower setting costs. These advantages and many others are completely described in Bulletin RB. Write for copy.

UNION IRON WORKS ★ ERIE, PA ★

BOILERS

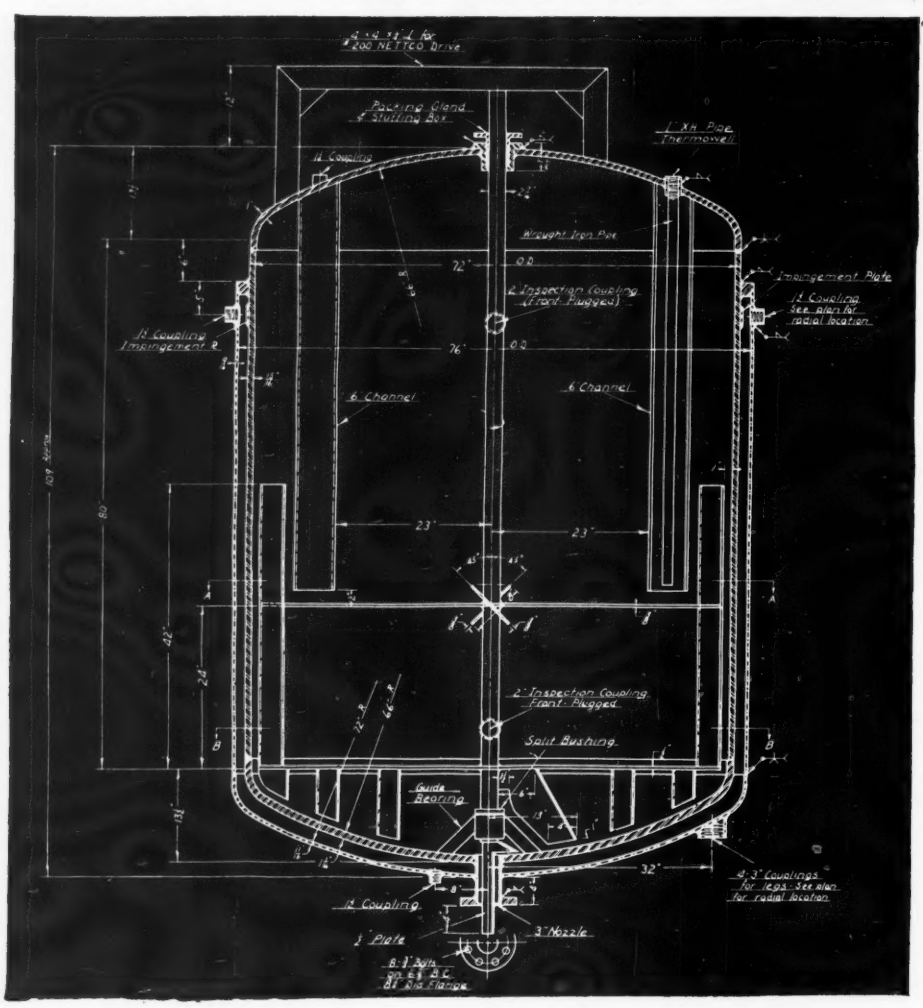
PRESSURE VESSELS • PLATE FABRICATION

Sturdy, Efficient, Adaptable

—THANKS TO A SPECIAL TYPE OF PATTERSON-KELLEY MIXER

PATTERSON - KELLEY STEAM - JACKETED MIXING KETTLE

A standard type jacketed kettle fitted with a specially designed Patterson-Kelley mixer. 76" O.D. x 109" high over the shell exclusive of supports. Constructed to the A.S.M.E. code for a working pressure of 150 lbs.



A.S.M.E. APPROVED DRAWING OF KETTLE ILLUSTRATED ABOVE

By varying the type, physical dimensions and rate of speed of the mixing mechanism, this Patterson-Kelley Steam-Jacketed Mixing Kettle can be adapted to any process requiring this kind of equipment.

ADVANCE NOTICE—Bulletin No. 203, a new informative circular on Patterson-Kelley equipment for the food and process industries, is going to press. Write for your copy today.

ESTD. 1886

PATTERSON-KELLEY FOR DEPENDABLE, ECONOMICAL SERVICE

PATTERSON-KELLEY HEAT EXCHANGE ENGINEERS

THE Patterson-Kelley CO., INC.

114 WARREN ST., EAST STROUDSBURG, PA.

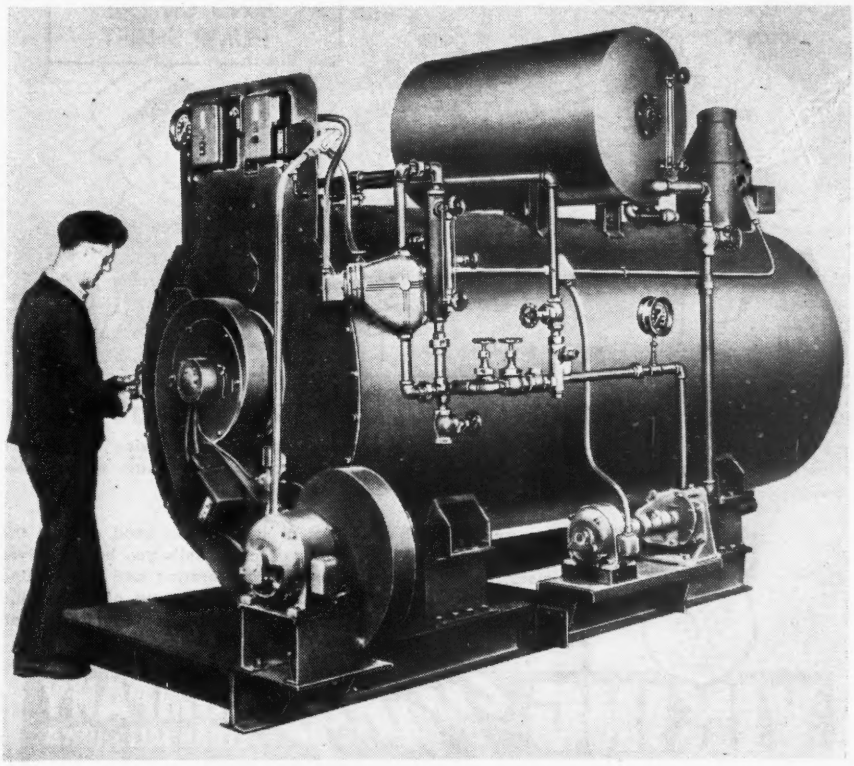
MANUFACTURERS FOR THE FOOD AND PROCESS INDUSTRIES

FOOD EQUIPMENT NEWS

Steam Boiler

ORR & SEMBOWER, INC., Reading, Pa., has brought out a new compact steam boiler called the "Powermaster," available in sizes from 10 to 100 boiler horsepower. This boiler is designed for fast operation and will produce 100 lb. pressures from 60 deg. F. water in 18 minutes. It is fully automatic and uses oil for fuel. In construction, it complies with ASME code requirements. The mounting is designed for easy transport and installation.

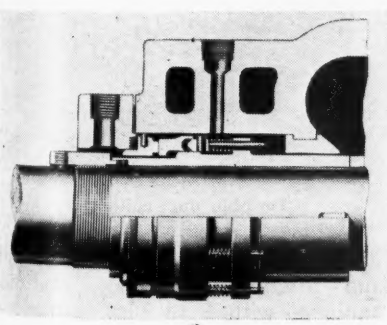
Among the advantages claimed by the maker for this new boiler are: (1) Three-pass construction that provides quick steaming, high efficiency and long boiler life. Since carbon collection is minimized by this construction, little cleaning is required. When cleaning is necessary, removal of the back plate permits easy access to the tubes. (2) The oil burner gives a rotary motion to the flame, so that it "hugs" the walls of the combustion chamber, giving longer gas travel and greater heat transmission. (3) The built-in condensate return system returns condensate as feedwater.



Automatic, compact steam boiler that comes in sizes from 10 to 100 boiler horsepower.

Stuffing Box Seal

INGERSOLL-RAND CO., 11 Broadway, New York 4, has brought out "Shaft-Seal," a sealing device for services in which unusual stuffing-box conditions



Seal of stuffing boxes, designed to meet severe conditions.

are encountered, as in the handling of viscous, volatile or corrosive liquids.

The sealing parts of this device are two rings with highly polished faces, true and flat, one stationary and the other rotating. These faces are brought into sliding contact under sufficient pressure to prevent the escape of fluid. The surfaces opposite the seal faces are seated against packing rings which prevent escape of fluid around the seal. The packing for the stationary ring is between the ring and the packing gland, while that for the rotating ring is between the ring and a spacing collar and rests on the shaft sleeve. The packing seats allow sufficient movement so that the seal faces maintain contact and alignment. The contact pressure between the sealing faces is very low. Thus there is little friction and wear.

Process Controls

ANY industrial processing schedule involving heating or cooling can be controlled automatically with the new line of Chronotrols announced by Wheelco Instruments Co., Harrison & Peoria Sts., Chicago 7, Ill. The temperature cycle desired is cut on a disk, which is rotated by a synchronous motor. As this disk rotates it moves the temperature-setting levers of the control instrument.

The instruments are built around the company's established line of pyrometers, potentiometers, thermometers and resistance thermometers, all of which employ an electronic principle of temperature control. They are available in 25 models, including ten for proportioning control and others for two-position on-off and three-position on-intermediate-off control for high- and low-temperature applications. Thermometers models are offered in both recording and indicating types.

Package Sealer

PACK-RITE MACHINES, 828 No. Broadway, Milwaukee 2, Wis., has developed the "Doughboy Toggle-Jaw Sealer," for the heat-sealing of packages. This machine, through a toggle action controlled by light pressure on a foot pedal, imparts great downward and sidewise pressure to the crimping bars.

Heating is by means of four 100-watt brass-sheathed heating elements, two upper and two lower, provided with Cutler-Hammer control. The machine, which will apply a 12-line horizontal crimp and will accommodate packages up to bags 8 in. wide, is 37½ in. high. It operates from any 110 volt a.c. or d.c. light socket.

Rubber Belt Repair

IT is possible to repair natural rubber belting with sections of belting made from the new GR-S synthetic rubber, B. F. Goodrich Co. reports. The synthetic product can be joined to the other with a vulcanized splice, and standard splicing and repair materials can be used with the synthetic belting.

HOW TIGHT SHOULD I SET THESE PACKING GLAND NUTS?
GO EASY THERE--TURN 'EM TOO TIGHT AND YOU'LL CAUSE PACKING TO BIND ON THE PUMP SHAFT
NUMBER SEVEN of a SERIES

How To Get The Most Work Out Of Your VIKING PUMPS

Your Viking Pump will give better service if you are careful not to turn packing gland nuts up too tightly. Too much pressure will cause packing to bind on the pump shaft, causing the bearings to run hot and throwing an overload on the motor or engine.

VIKING PUMPS — FIRST IN AMERICA

Because pumps are hard to get it pays to take good care of the ones you have. The Viking Service Manual tells you how. It gives you clear, practical help in mounting, operating and maintaining Viking Rotary Pumps. Write today for your copy of the Viking Service Manual. IT'S FREE and will be sent to you by return mail.

VIKING Pump COMPANY
CEDAR FALLS, IOWA

STAINLESS STEEL
COPPER
GALVANIZED
PHOSPHOR BRONZE
MONEL
STEEL
Are you sure you're using
The most efficient metal
for your Wire Cloth requirements?
In most wire cloth installations, 90% of the efficiency hinges on the correct selection of metal.
To assure unfailing performance—longest possible life of the cloth—lowest operating and maintenance costs, make certain that the metal you specify is the most efficient for your own conditions.
What factors are involved in your uses of wire cloth—rust—corrosion—abrasion—high temperature—strains?
★ "Buffalo Wire" gladly offers an analysis of materials and their properties. This valuable information is concisely presented in Bulletin 603, "How to Select and Specify Industrial Wire Cloth." Copies mailed free on request.
How to Select and Specify Buffalo INDUSTRIAL WIRE CLOTH to Meet Your Own Requirements
MANUFACTURER OF ALL KINDS OF WIRE CLOTH FOR 73 YEARS
Buffalo WIRE WORKS CO., INC.

452 TERRACE BUFFALO 2, N. Y.

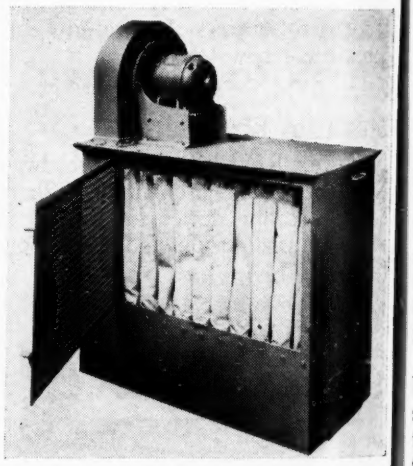
Waterproof Sealer

WATERPROOF sealing of containers destined for overseas shipping is said to be easily accomplished with the Solseal paper tape developed by McLaurin-Jones Co., Brookfield, Mass. In applying the tape to a container, the adhesive is moistened with a special solvent furnished with the tape. Seventy-two hours after application, the bond becomes complete and absolutely watertight, the manufacturer claims. After that time, if the package is otherwise waterproof, it can be immersed in water for a long time with no damaging effects to the contents. In immersion tests the tape showed no tendency to release.

The new sealing tape is obtainable in different grades and weights. A string-filled type designed to take the place of steel and wire bindings is manufactured.

Portable Dust Collector

NORTHERN BLOWER CO., 6502 Barberton Ave., Cleveland 2, Ohio, is making a line of portable, bag-type dust-collection units ranging from 300 cu.ft. per minute up and having up to 8-in. static pressure at the fan. These collectors are designed for light dust loads and intermittent service, and are equipped with ¾- to 3-hp. motors.

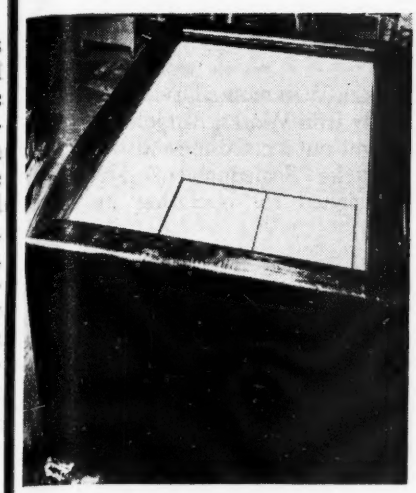


Portable dust collector.

Cylindrical bags are used in these units, with dust-laden air entering at the bottom and flowing upward inside the bags against gravity. The bags are cleaned by hand shaking.

Building Protection

A. C. HORN CO., 43-36 Tenth St., Long Island City 1, N. Y., has brought out "Waterfoil," for application to concrete, brick or stucco surfaces to protect against the weather, inhibit rusting of steel reinforcing and avoid spalling. The product also improves the appearance of the masonry.



A tank lined with Carrara structural glass.

Glass Equipment

HIGH-STRENGTH, heat-treated Carrara glass for use in food processing equipment is announced by Pittsburgh Plate Glass Co. (Glass Division), Grant Bldg., Pittsburgh, Pa. According to the manufacturer's specifications, it is four times as strong, flexible and tough as ordinary glass of equal thickness, and it withstands constant temperatures up to 650 deg. F., as well as sudden changes in temperature.

Intended to take the place of wartime critical metals, the new glass is immune to attack by practically all food acids, fumes and chemicals.

The glass, either opaque or transparent, can be manufactured in a variety of shapes and forms to fit the requirements of different food processes. It can be made in bent shapes, in pierced disks, in narrow strips, in flat plates for tank linings, and it comes in a wide range of thicknesses.

Tanks made of the glass are said to be especially suitable for mixing and storing operations in the food industries. This glass presents a smooth, flat, completely sanitary surface that is easily cleaned.

The problem of joining sections of the glass in making tanks is reported to have been solved. The glass is made in large sheets, so that for tanks of medium size there are joints only at the corners. All joints are accurately ground, to fit tightly, like the stopper in a chemist's bottle. Extra security is provided by a specially developed joining material.

To serve the double purpose of insurance against leakage and against severe physical blows, the tank usually is surrounded by a wooden framework filled with a compound.

The Pittsburgh Plate Glass Co. reports that it is set up to install completely new tank units and to reline existent tanks on the floor at plants in any part of the country.

Neat as a

WHETHER your business is vest-pocket or vast, keeping equipment and facilities clean is always a challenge. And primed to help you meet that challenge—with instant and *thorough* effectiveness—is Wyandotte!

Keeping plants and equipment of *any* kind "neat as a pin" is a habit with the full and varied Wyandotte line of cleaning and germicidal products. It takes proper planning *today*, with the many new phases of food industries—dehydrating, canning, quick freezing and so on—and the all-vital role food plays in the war. And Wyandotte, as usual, is *doing* such jobs with speed and minimum labor.

Wyandotte Products are foremost in maintaining sanitation by keeping *all* facilities involved in food processing spick-and-span. And backing them up with the training and knowledge of experts, are the Wyandotte Service Representatives, always on call for help with cleaning and sanitation problems—at no obligation.

Wyandotte

REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION • J. B. FORD DIVISION

WYANDOTTE, MICHIGAN

Service Representatives in 88 Cities

ARMY TWILL BY REEVES SANFORIZED* MADE TO GOVERNMENT SPECIFICATIONS

REEVES Glengarrie POPLIN

Demand these labels when buying uniforms

UNIFORMS OF REEVES ARMY TWILL CAN TAKE IT!

Uniforms that are neat in appearance and easy to keep clean are essential in the food industry. So specify *Reeves* famous fabrics for *your* uniforms.

REEVES ARMY TWILL meets exacting U. S. Government Tests for better wear, longer life, and colorfastness. Its fabric vitality keeps it "in shape" under trying conditions.

For matching shirts, specify GLENGARRIE POPLIN, a durable, stylish fabric in a wide range of colors. Both fabrics are Sanforized* against shrinking.

**Fabric shrinkage not more than 1% (U. S. Government Test CCC-T-191-a)*

See your nearest dealer for uniforms, sport and work clothes made from these famous fabrics, or write for colorful leaflet to:

OVER 60 million yards of Reeves Army Twill sold to the U.S. Army

REEVES BROTHERS, INC.

54 WORTH STREET NEW YORK CITY

RYERSON STEEL IN STOCK

Call Ryerson for any kind, shape or size of steel you need. Steel for manufacturing, maintenance or construction ...all products are available for immediate shipment from any one of the ten convenient Ryerson Steel-Service Plants. Ask for a stock list...your guide to steel.

Principal Products Include:

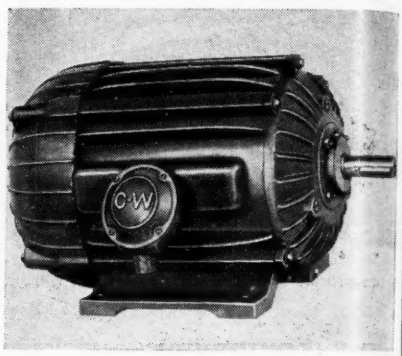
Bars • Shapes • Structurals
Plates • Sheets • Floor Plates
Alloy Steels • Tool Steels
Stainless Steel • Screw Stock
Wire • Mechanical Tubing
Reinforcing Steels • Shafting
Babbitt • Nuts • Bolts
Rivets • Welding Rod • Etc.

JOSEPH T. RYERSON & SON, INC.

STEEL-SERVICE PLANTS AT: CHICAGO, MILWAUKEE, ST. LOUIS, DETROIT, CLEVELAND, CINCINNATI, BUFFALO, BOSTON, PHILADELPHIA, JERSEY CITY

Corrosion-resistant Motor

CROKER-WHEELER DIVISION, Joshua Hendy Iron Works, Ampere, N. J., has brought out a corrosion-resistant motor called the "Sealedpower." This motor is designed for operation in atmospheres containing dust, corrosive vapors or gases, or excessive moisture. It is available in sizes from 1 to 15 hp., and can be furnished to operate from any polyphase power supply.



Totally enclosed, corrosion-resistant motor.

The new motor is of the totally enclosed, fan-cooled type, but has no cooling ducts that might become fouled with wet or sticky dusts. All exposed parts are acid and alkali resistant to a high degree. In addition to the mechanical sealing of the entire motor, each coil is individually sealed against moisture, fumes, vapor and dust by the vacuum impregnation process.

Fat Recovery Basin

FOR use in meat packing plants, dairies and other food processing plants where it is desired to collect and salvage fats and oils, Hottman Machine Co., 3327 Allen St., Philadelphia, Pa., has developed a unit called "Victory Fat Recovery Basin." Made from non-critical materials, the basin is non-corrosive and can be easily kept in sanitary condition. It is designed to separate from the waste waters of the plant the fats and oils that they contain, before the water goes to the sewer. In addition to recovering this material, it also lessens the problem of sewer cleaning and avoids stream pollution.

Glass Cleaner

BERMAN CHEMICAL CO., Dept. 526, Toledo 2, Ohio, has developed "Sof-T-Klenz," a compound that removes light-retarding films from glass. Tests made with a Weston light meter are said to show that glass roofs that had never been cleaned transmitted from 30 to 60 percent more light after cleaning with this compound.

LETTERS TO THE EDITOR

Reserves Needed For Postwar Preparation

To the Editor of Food Industries:

Your editorial, Postwar Preparation —VI, contains several points that are basic. I quote:

"The time has now come for something more than planning. Planning must advance to preparation."

"No form of government can long endure that does not constantly raise the standard of living of its people."

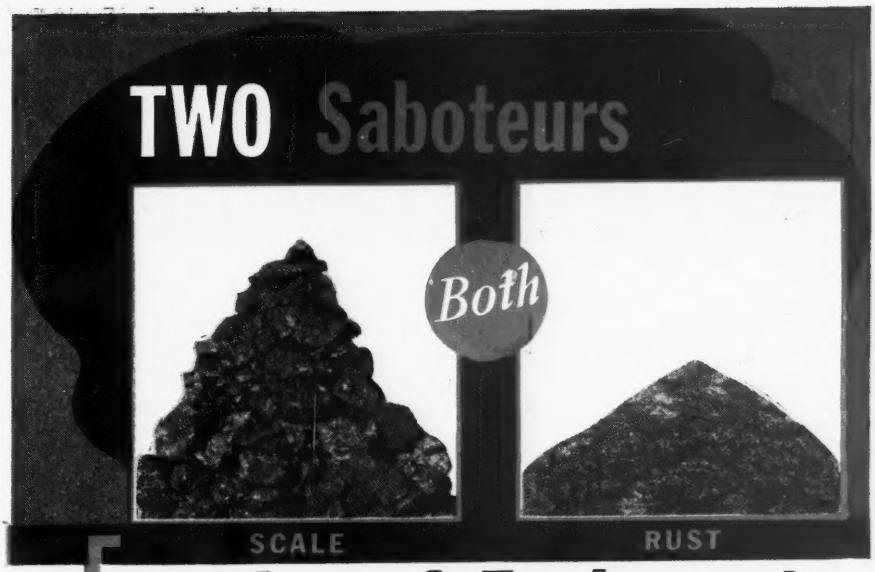
"It only can be put into effect by the actual deeds of employers."

There is no question of the need of preparation *now*. That point is undebatable. But how can "employers" plan or prepare if they are not allowed to accumulate a reserve of money? Did you read the statement of Jack & Heintz, Inc., probably published in the newspapers all over the country? It was in the *Philadelphia Evening Bulletin* of January 15.

All big manufacturers, the ones who converted to war needs and saved our existence as a nation, are prevented from preparing for peace. Friends of mine who are working in plants converted to war work are worried about this. They don't want government work or relief. A very good Democrat, Grover Cleveland, said that the people should not be dependent on the government. That was true then and still is.

I consider that the existing tax laws take care of excessive profits, and so forth. Why should industry be further drained by War Department price adjustment? I'll bet the War Department didn't initiate it. It's job is to make war, not to impoverish industry. The effect can only be to make our people more dependent on the government, and that is apparently being done deliberately.

Is that the way to raise the standard of our country, which, by the way, is not a new principle? George Washington said in his second inaugural address: "Let us raise a standard to which the wise and honest can repair." He and all of our founders believed implicitly in free, private enterprise and opportunity. I believe that the American people, and particularly the returning service men and women, will see to it that we get back to that principle quickly. Our fighting men and women may save us in peace as they are saving us in war.—V. L. SANDERSON, *Process and Power Specialties, Philadelphia, Pa.*



Enemies of Equipment

It is usually difficult to entirely prevent lime-scale and rust from building up in your water-cooled, water-circulating or steam-jacketed equipment. But what you CAN DO is to stop these insulating deposits from interfering with proper heat transfer, from impairing equipment operating efficiency, from shortening equipment service life. How? By periodically removing these deposits from equipment with

OAKITE COMPOUND No. 32

This effective widely used Oakite material is today's two-fisted answer for removing lime-scale and rust deposits THOROUGHLY. When you try it, you will find that it helps restore heat transfer ... increases working efficiency of unit. Oakite Compound No. 32 does this without harming the surfaces treated ... and economically.

USE OAKITE COMPOUND No. 32 ON SUCH EQUIPMENT AS

dough mixers
steam-jacketed cookers
cream beaters
candy cooking slabs
bread coolers
blanchers
steam tables
milk cooling vats
bottle washing machines
can washing machines
heat exchangers
ammonia condensers
water-cooled compressors
dish washing machines

FREE MANUAL TO HELP YOU!

Send for this 28-page FREE manual, based on our many years experience in descaling equipment of practically every type and description. You will find it invaluable in your daily maintenance work. Write for your copy TODAY. FREE for the asking!

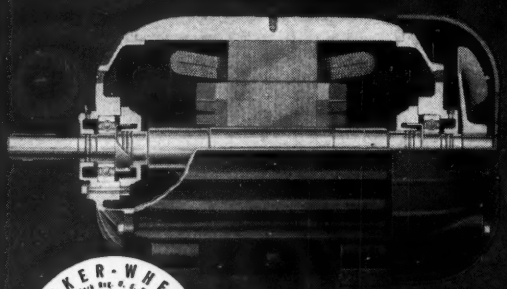
OAKITE PRODUCTS, INC., 26G Thames St., NEW YORK 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE MATERIALS METHODS SERVICE — Buy Bonds for Victory — CLEANING FOR EVERY CLEANING REQUIREMENT

FOR

- Sulphur & Sulphuric Acid Handling Plants
- Rubber Mills
- Cotton Mills & Gins
- Lime Kilns
- Sugar Refining
- Aluminum Plants
- Turpentine & Rosin Plants
- Tanneries
- Drug Manufacturing
- Paint & Varnish Plants
- Breweries
- Ceramics Plants
- Food Processing
- Fertilizer Handling
- Cement Mills
- Oil and Fat Recovery
- Flour Mills



CROCKER-WHEELER Motors-Generators

SEALEDPOWER
(Cowl-cooled) . . . available for all polyphase alternating current circuits, 2 to 15 horsepower. Write for detailed literature, or call our nearest office.

FOR

- Wet Mines
- Feed Mills
- Coke Plants
- Wood Working Mills
- Textile Mills
- Paper & Pulp Mills
- Glass Manufacturing
- Packing Plants
- Laundries
- Galvanizing & Pickling Processes
- Dye Houses and Bleacheries
- Soap Manufacturing
- Crushing & Grinding Mills
- Coal Tipples and Pulverizers
- Foundries
- Cement Mills
- Grain Elevators, Etc.

Now a Corrosion-Resistant *SEALEDPOWER* Motor

PROTECTED AGAINST: acid fumes, alkali fumes, splashing or dripping corrosive liquids, air-borne moisture, steam, corrosive gases, conducting dusts, metallic chips, etc.

PROTECTED BY: a corrosion-resistant frame, cooled by a built-in corrosion-resistant fan. The windings are *doubly* protected from damage by Crocker-Wheeler's vacuum-impregnation process which seals *each* coil individually against moisture, fumes or dirt.

BRUTALLY TESTED! The seal's effectiveness is proved by laboratory tests (at right) and by hundreds of satisfactory installations.

1 ***SEALEDPOWER*** **motor was placed in tank containing several inches of water and run continuously for 8 hours (see photo). It stood idle in water overnight, then was run 8 more hours. During motor's operation, the external ventilating fan drenched the outside of the frame with water. At end of test, the motor was disassembled and found to be *completely dry* inside.**

2 A dense atmosphere of extremely fine French chalk was kept circulating around the motor and through its ventilating system for many hours. No trace of chalk was found inside upon disassembly.

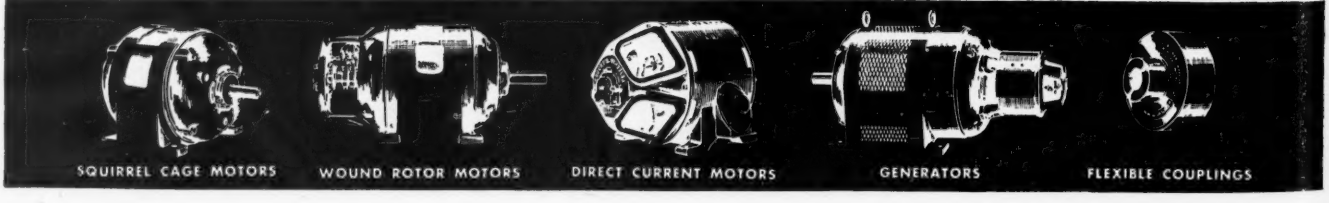
JOSHUA HENDY IRON WORKS

CROCKER-WHEELER DIVISION

ESTABLISHED 1856

AMPERE, NEW JERSEY

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • ST. LOUIS • WASHINGTON • LOS ANGELES



SQUIRREL CAGE MOTORS | WOUND ROTOR MOTORS | DIRECT CURRENT MOTORS | GENERATORS | FLEXIBLE COUPLINGS

CATALOGS & BULLETINS

FOOD PLANT EQUIPMENT

Feed-water Conditioning—"Improvements in the Hot Process Water Softener," a 4-page illustrated reprint, No. 30, by C. E. Nichols, briefly outlines the development of this method of feed-water conditioning, discusses the chemical reagents used and includes diagrams of several typical installations; issued by Cochrane Corp., 17th & Allegheny Ave., Philadelphia 32, Pa.

Feed-water Control—The principles of boiler-feed-water control, the mechanical equipment available to meet various operating conditions, and differential-pressure and feed-pump pressure control are described in the sixth edition of "Mechanical Feed Water Regulation for Boilers," by A. P. Culver; published by Northern Equipment Co., 1945 Grove Drive, Erie, Pa.

Heat Diffusers—A 4-page folder, 46PQR-7, describing the advantages of four models of blower-type heat diffusers used in heating and ventilating large areas, and including charts of B.t.u. constants and steam ratings, dimension drawings of horizontal and vertical suspended units and floor-mounted units, has been published by Carrier Corp., Syracuse 1, N. Y.

Packaging Equipment—A 20-page booklet which describes weighing, filling, measuring and carton-sealing equipment and photographically illustrates the installation of such equipment in food plants has been issued by Triangle Package Machinery Co., 1006-920 N. Spaulding Ave., Chicago 51.

Processing Equipment—Pictures, specification tables, advantages and typical applications of equipment used in feeding, conveying, weighing, cooling, drying and screening operations are given in Catalog 965, "Jeffrey Equipment for the Process Industries," by Jeffrey Mfg. Co., 956-99 N. Fourth St., Columbus, Ohio.

Proportioning Equipment—A 16-page catalog, Bulletin 1100, containing specific applications, a capacity schedule, diagrams and operating procedures for Adjust-O-Feeder diaphragm- and plunger-type pumps, and fully describing and illustrating automatic time-cycle control and intermittent boiler-water conditioning systems, has been published by Proportioneers, Inc., Providence 1, R. I.

Steam Peeler—Designed to increase production and eliminate waste by removing skins from such root vegetables as white potatoes, sweet potatoes, beets and carrots, the Pfaudler steam peeler is described and illustrated in 4-page Bulletin 824 by Pfaudler Co., 89 East Ave., Rochester 4, N. Y.

Unit Heaters—A five-way, vertical discharge propeller fan unit which insures wide heating coverage and flexibility is described and illustrated in 2-page sheet, 46-S, by Carrier Corp., Syracuse 1, N. Y. Chart dimensions, steam ratings and B.t.u. constants are also given.

Water Softeners—How to increase the capacity and efficiency of zeolite water softeners, as well of iron removal, filtration, aeration and boiler-water conditioning equipment, is discussed in Bulletin No. 603, published by Elgin Softener Corp., Elgin, Ill.

PLANT SUPPLIES

Abrasive Resistance Wire Cloth—Descriptions and illustrations of "Buff-Aloy" abrasive resistant wire cloth for stone, sand, gravel and abrasive industries, and a table of wire diameters for mineral aggregate production screens, are found in Bulletin 601 put out by Buffalo Wire Works Co., Inc., 320 Terrace, Buffalo 2, N. Y.

Aluminum—Twelve economic advantages of aluminum, one of which is particularly important to the food industry—its nontoxicity to most food and beverage products—are discussed in a 24-page booklet entitled, "Aluminum Imagineering Notebook," issued by Aluminum Co. of America, 1856 Gulf Bldg., Pittsburgh 19, Pa.

Chain Belt Drives—Information on maintenance, lubrication and repair of chain belt drives during wartime is contained in Bulletin No. 435, a 20-page illustrated catalog issued by Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

Diamond-mesh Fabric—Methods for specifying both square and long diamond mesh wire cloth, together with types of installations—such as guards, partitions, grilles and panels, for which the material is most commonly used—are given in Bulletin 602, published by Buffalo Wire Works Co., Inc., 320 Terrace, Buffalo 2, N. Y.

V-Belts—Possessing the advantages of strength, flexibility and stretch resistency, wire grommet V-belts are described and illustrated in a 4-page pamphlet put out by B. F. Goodrich Co., Akron, Ohio.

Wire Cloth—Information and tables on how to select and specify types of industrial wire cloth, from 2 to 100 mesh, are given in Bulletin 603 by Buffalo Wire Works Co., Inc., 320 Terrace, Buffalo 2, N. Y.

Welded Steel Tubing—An illustrated chart showing markings adopted by various welded steel tubing manufacturers to identify tubing used in heat exchangers, condensers and other heat-transfer apparatus has been published by Formed Steel Tube Institute, 1621 Euclid Ave., Cleveland.

CONTROL EQUIPMENT

Chemical Thermometers—Illustrations, a temperature conversion table and temperature scales in centrigrade and Fahrenheit degrees, for numerous types of chemical thermometers used in general testing, engineering and industrial and laboratory work, are found in Catalog No. 44 issued by Faichney Instrument Corp., Watertown, N. Y.

Control Equipment—Automatically controlled Pyromaster potentiometer pyrometers, for temperatures up to 3600 deg. F., and recorders and indicators are described and illustrated in 6-page Bulletin DM008 by Bristol Co., Waterbury 91, Conn.

Photoelectric Colorimeters—For use in colorimetric and turbidimetric analysis and designed for operation with full-length test tubes, the Pulmetron Photoelectric Colorimeter Model 400-A and 400-G is described in a 4-page booklet put out by Photovolt Corp., 95 Madison Ave., New York 16.

Thermostats—Specifications for straight and angle type Benderstat mercurial thermostats with temperature ranges from 32 to 160 deg. F., for calibrating against standards and in checking electrical characteristics of completed instruments, are described in Bulletin No. 344 issued by Bender Scientific Glass, Inc., 2529 N. Carlisle St., Philadelphia 32, Pa.

MISCELLANEOUS

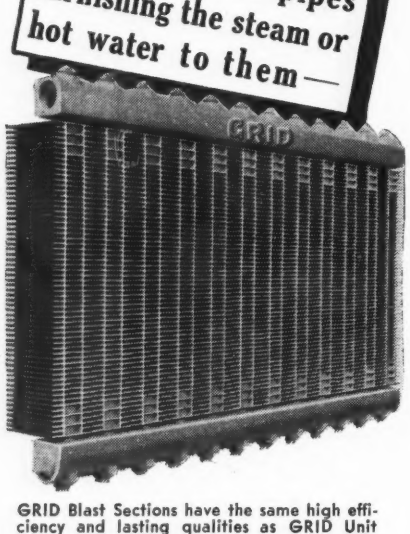
Citrus Plant Sanitation—Of particular interest to canners and packers of citrus fruits is a 28-page illustrated pamphlet describing in detail procedures which speed up fruit washing and the daily clean-up of processing and handling equipment. Entitled, "Increasing Efficiency of Citrus Fruit Washing, Plant Sanitation and Maintenance Procedures," the bulletin has been published by Oakite Products, Inc., 26G Thames St., New York 6.

Testing Laboratories—The part research and testing laboratories will play in the postwar world is briefly outlined in a 24-page catalog entitled "A New World," by United States Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.

Truck Tire Maintenance—The eight most common causes of truck tire failures, such as overloading, improper inflation, excessive speed and mechanical irregularities, and how they can be prevented, are described in a 16-page illustrated catalog, entitled "How To Prevent Truck Tire Failures," published by B. F. Goodrich Co., Akron, Ohio.

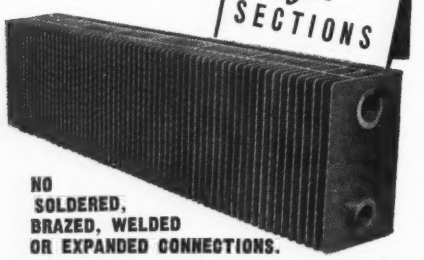
DO AWAY WITH MAINTENANCE COSTS on BLAST SECTIONS—

Install Blast Sections that will stand wear as long as the pipes furnishing the steam or hot water to them—



GRID Blast Sections have the same high efficiency and lasting qualities as GRID Unit Heaters—made of high test cast iron. No Tortuous air passages, GRID Blast Sections are constructed to permit freedom of expansion with complete absence of ruptures, strains and warping. Compact, they occupy less space than other types of cast iron blast coils of equal capacity. Atmospheric conditions, such as dust, fumes, lint, etc., cannot retard their operation. Guaranteed for steam pressures up to 250 lbs. Ideal for installation where outside air is brought into the building, and strong enough to withstand freezing better than other types of blast coils now made for this use.

ONE PIECE CONSTRUCTION "fin" SECTIONS



NO SOLDERED, BRAZED, WELDED OR EXPANDED CONNECTIONS.

GRID condenser "fin" sections are made in one piece of high test cast iron. There's nothing to become loose, nothing to develop leaks, breakdowns, or heating failures . . . no electrolysis can develop to cause corrosion . . . GRID open design makes possible easy cleaning. Catalog and capacity tables upon request.

D. J. MURRAY MANUFACTURING CO.
WAUSAU, WISCONSIN

Offices in Principal Cities

GRID

BOOKS

African Food Supply

THE FOOD RESOURCES OF AFRICA. By Thomas S. Githens and Carroll E. Wood, Jr. Published by University of Pennsylvania Press, The University Museum, Philadelphia, Pa., 1943. 105 pages; 8½x5½ in.; paper. Price, $1.50.

Because of its proximity to most of the world battle fronts, Africa is assuming a new position as a food supplier during these war years. And the development of food manufacturing plants which is now in progress indicates that the dark continent is going to retain much of its present importance after the war.

This book is therefore both timely and interesting in that it holds a fund of information on African food growth not previously available. In its closely written pages, the book covers Tropical and North Africa in separate sections, with chapters on West, Equatorial, North East, East and French North Africa. The careful reader will get a comprehensive picture, not only of the present food supply, but of the even greater future possibilities in the fruit and vegetable fields that Africa holds in store.

Outlook for Dehydration

DEHYDRATION, ITS POSTWAR FUTURE. By Lawrence K. Harper. Published by E. W. Williams Publications, Inc., New York City, 1943. 132 pages; 6x9 in.; cloth. Price, $2.75

Those who have consigned food dehydration to an early postwar grave might alter their predictions after reading Mr. Harper's book. While no rosy path for the future is predicted, the book does offer sound reasons for the belief that this form of food processing will climb to higher levels in our peacetime economy. By way of discouraging adverse judgment, the author points out that scientific improvement is going forward at an astounding rate.

The book reviews briefly the history of dehydration from early times through World War I and the years immediately following. The present era really begins in 1926, with the greatest expansion not taking place until after Pearl Harbor.

Though war requirements have brought about its greatest expansion, Mr. Harper thinks the greatest possibilities for dehydration are still ahead because of the lower costs of distribution. The postwar feeding of Europe will be another factor, as will competition from other countries.

While the book is not a technical treatise, everyone interested in dehydration will find its chapters well worth reading.

Nutrition Study Revised

ROSE'S FOUNDATIONS OF NUTRITION. Revised by Grace MacLeod and Clara Mae Taylor. Published by MacMillan Co., New York, 1944. 594 pages; 5½x8½ in.; cloth. Price, $3.75.

This fourth edition of a book first published in 1927 is the first revision by anyone other than the author, Mary Swartz Rose, whose death in 1941 cut short plans which have been carried out here by two professors of nutrition at Teachers College, Columbia University.

A great deal of reorganization of material in the earlier editions has been done in this revision, while progress in many of the fields covered by the book has necessitated the complete rewriting of some of the chapters. This is especially true in the chapters on dietary planning, where the selection of adequate diets has been simplified. The figures for the construction of adequate dietaries on the basis of percentage distribution of calories among food groups also have been recalculated.

As in the earlier editions, the essential factors in an adequate diet are discussed in detail, as are the food sources of these essentials.

Glue and Gelatine

GLUE AND GELATINE. By Paul I. Smith. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn, N. Y. 1943. 142 pages; 5¾x8¾ in.; cloth. Price, $3.75.

Gelatine's uses in the food industries and its value as a food in itself are discussed concisely, but informatively, in a short chapter of this little book. This chapter touches upon the use of gelatine in ice cream to prevent the formation of large ice crystals, in candy to prevent the development of large sugar crystals, in infant food as a protective colloid, in desserts, meat extracts and meat preparations as a gelling medium, in preserves as a thickener and in salad creams as a stabilizer.

For the most part, this book is written for the manufacturers of glue and gelatine. It discusses the raw materials, chemistry and processing methods, as well as suitable corrosion-resistant plastics used in the construction of plant equipment. The various uses of glue and the many applications of gelatine other than those in the food industries are covered.

(*Continued from page 78*)

B. Effect of Storage Time and Temperature—Storage at 130 deg. F. quickly reduced the overall quality of the product. After one month at this temperature, the product had become practically inedible, had darkened appreciably in color (visual observation) and would no longer jelly. This deterioration had gone so far after three months that examinations of the product stored at 130 deg. F. were discontinued. Storage at 98 deg. F. had the same general effect, although to a far lesser degree. At ordinary room temperature the product was still in good condition after 12 months' storage.

At 130 deg. F., the ascorbic acid content had decreased to 65 per cent of its original value after one month, and to about 40 percent of its original value after three months. Storage at 98 deg. F. reduced the ascorbic acid value to about 65 percent in three months and to about 60 percent in six months. At 75 to 80 deg. F., it was reduced to about 85 percent in four months and apparently remained at about this level through 12 months' storage.

At the elevated temperatures, considerable CO_2 was given off by the product. The evolution is greater in the presence of oxygen. The largest amount found was in the air-packed sample stored at 130 deg. F. for three months. Analyses of the gas in this can showed the presence of almost 30 percent CO_2 compared to an initial CO_2 content of about 0.3 percent. The rate of evolution at 98 deg. F. was considerably less and at 75 to 80 deg. F. it resulted in a carbon dioxide content of about 4 percent in the air-packed can after 12 months' storage.

TABLE V—Powdered Dehydrated Cranberries

Results of periodic moisture determinations on product.

Storage time	Storage temperature (deg. F.)	Package	Moisture content percent of total weight	Caking or lumping
Initial	...	.....	2.0	None
1 month	98*	Carton	3.0	....
3 months	98*	Carton	3.4	....
6 months	98	Can—air	2.9	Slight
	98	Can—N_2	3.0	Slight
	98*	Carton	3.9	Definite
6 months	75	Can—air	2.7	Very slight
	75	Can—N_2	1.7	Very slight
	75	Carton	2.7	Slight
12 months	98	Can—air	3.5	Slight
	98	Can—N_2	3.5	Slight
	98	Carton	5.1	Very definite
12 months	75	Can—air	3.2	Very slight
	75	Can—N_2	2.0	Very slight
	75	Carton	2.8	Definite

*The paper packages stored at 98 deg. F. were also subjected to a relative humidity of 93 percent.

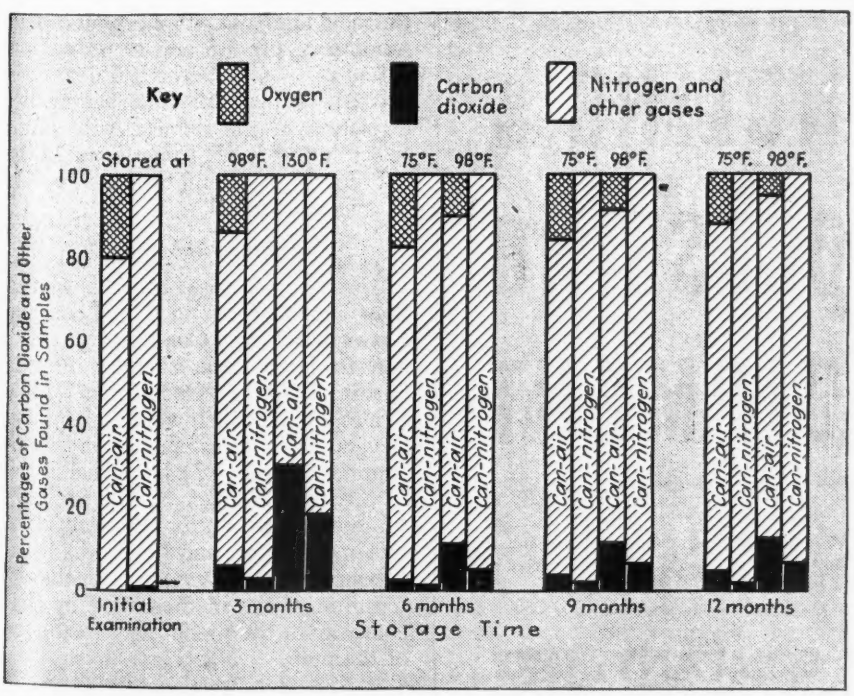


FIG. 7. Effect of storage time and packaging on evolution of carbon dioxide by powdered dehydrated cranberries packed in air and in nitrogen.

Discussion of Results

1. The evolution of CO_2 at elevated storage temperatures is evidently the result of decomposition in the product. Apparently, the presence of oxygen increases the rate at which the gas is evolved.

TABLE IV—Powdered Dehydrated Cranberries

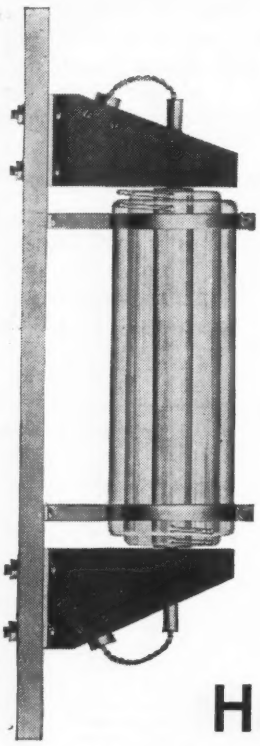
Results of periodic weighings of product packed in cartons and stored at 98 deg. F. and 93 percent relative humidity.

Storage time	Number of samples weighed	Average percent increase in product weight over original*
Initial	10	....
1 month	9	0.42
3 months	7	0.72
6 months	6	1.27
9 months	4	1.43
12 months	3	1.70

*These figures are corrected for the weight of water picked up by the paper in the container (4 percent increase in container weight in 5 days).

2. The reasons for the apparent increase in moisture content of the samples stored at 98 deg. F. and hermetically sealed in cans have not been clearly determined. Several probable reasons for this increase have been mentioned, such as the probability that one of the end products of chemical decomposition (chiefly of the sugars present) at this temperature is water. This explanation has some substantiation in that appreciable quantities of CO_2 were found in the cans, which gas would be one of the other end products of such decomposition. However, this does not completely explain the total amount of additional water found in view of the quantities of CO_2 known to be present. Another probable explanation is that, concurrently with the above, decomposition takes place to produce products which are also driven off during the vacuum drying for the moisture determination; or partial decomposition may take place to give products which are decomposed further and driven off during the vacuum drying. These types of thermal decomposition would result, of course, in a loss in weight in addition to that caused by evaporation of the moisture present.

The foregoing article is the third in a series that will cover a dozen dehydrated foods. Part I, the introduction and procedure, together with Part II, pertaining to apple nuggets, appeared in March. Part IV, to be published in the May issue, will cover dehydrated carrots.—The Editors.



APPARATUS FOR

producing

VITAMIN D

FROM STEROLS BY

IRRADIATION

WITH ULTRA-VIOLET RAYS

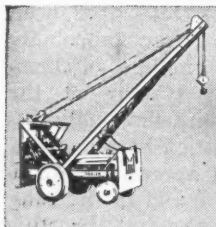
Write for full particulars

HANOVIA

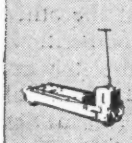
CHEMICAL & MANUFACTURING CO.

Dept. FI-1 Newark, 5, N. J.

FOR 38 YEARS LEADERS IN SPECIAL ULTRA-VIOLET EQUIPMENT



MATERIALS HANDLING & PROCESSING EQUIPMENT



WHEEL TRACTOR CRANES

HOISTING UNITS

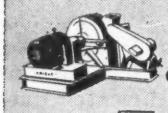
TRAILER TRUCKS

LIFT TRUCKS

CONVEYORS

CARTS & TOOL WAGONS

ELEVATORS



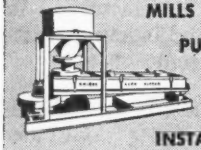
GYRO SIFTERS

CRUSHERS

CUTTERS

MILLS & MIXERS

PULVERIZERS



GRINDERS

COMPLETE INSTALLATIONS

The handling equipment construction "know-how" of the Mercer Engineering Works, Inc., Clifton, N. J. . . . The more than 40 years processing equipment experience of Robinson Mfg. Co., Muncy, Pa. . . . All are embodied in and represented by

MERCER-ROBINSON COMPANY, INC.

INQUIRIES INVITED 30 CHURCH ST., NEW YORK 7, N. Y.

Grapefruit Cannery Waste Yields Crude Pectin

(*Continued from page 96*)

excess liquid by pressing without affecting the pectin grade of the finished product.

Pectin may be extracted from this raw material by means of hot acid solutions which hydrolyze the protopectin to pectin. The acid extract thus obtained can be used by manufacturers of jams, jellies and marmalades. The acidity of the organic acid solutions used, as measured by pH values, varied from 2.0 to 2.5. The inorganic acid solutions used had pH values between 1.5 and 2.5. Temperatures of extractions were 176 and 208 deg. F. Times for extractions varied from 20 minutes to 2 hours. The dried pomace which was used in these extractions was ground to pass through 16-, 32-, and 64-mesh screens.

The maximum grades of the pectins extracted from the grapefruit pomace with phosphoric acid, citric acid, sulphurous acid, and lactic acid were as follows: 70, with phosphoric acid of pH 1.5 (Table IV); 55, with citric acid of pH 2.0 (Table II); 45, with sulphurous acid of pH 1.5 and 2.0 (Table III); and 36, with lactic acid of pH 2.1 (Table V).

There is some belief that the use of phosphoric acid may impart undesirable qualities to jams, jellies, and marmalades and may also create an unfavorable public reaction. Therefore, from a commercial standpoint, the citric acid extraction would probably be the most desirable. For maximum pectin yield, the use of phosphoric acid solution of pH 1.5 and an extraction period of 30 minutes at 176 deg. F. is advised. When this is objectionable, extraction of the pomace with citric acid solution at pH values from 2.0 to 2.25 for 35 to 60 minutes at 208 deg. F. is recommended.

Acknowledgment

The authors wish to acknowledge their indebtedness to (1) Louisville Drying Machinery Co., Louisville, Ky., and to J. S. Peck, chemist, Florida Citrus Canners' Cooperative, Lake Wales, Fla., for their work in preparing the grapefruit citrus pomace on a semi-commercial scale; (2) J. L. Heid of the U. S. Citrus Products Station for helpful suggestions during the course of this investigation; and (3) Sardik Food Products Corp., New York, for the description of the method used by that company in the preliminary treatment of the pulp.

References

1. H. D. Poore, Recovery of Naringin and Pectin from Grapefruit Residue, *Industrial and*

Engineering Chemistry, Industrial Edition, vol. 26, 637–639, 1934.

2. G. Bosurgi and K. Fiedler, A Method for the Elimination of Bitter Substances from the Fibre of Pectin Containing Plant Materials in General and Particularly from the Peel of Acid Fruit, British Patent Specification No. 388284, Feb. 23, 1933.

3. P. B. Myers and G. L. Baker, Fruit Jellies —VI, The Role of Pectin—2, The Extraction of Pectin from Pectic Materials, Delaware Agricultural Experiment Station *Bulletin* No. 160, *Technical Paper* No. 20, 1929.

4. P. B. Myers and G. L. Baker, Fruit Jellies —VII, The Role of Pectin—3, Effect of Temperature upon the Extraction of Pectin, Delaware Agricultural Experiment Station *Bulletin* No. 168, *Technical Paper* No. 12, 1931.

5. D. K. Tressler, M. A. Joslyn and G. L. Marsh, "Fruit and Vegetable Juices," p. 220–221 Avi Publishing Co., New York, 1939.

6. L. W. Tarr, A Study of the Factors Affecting the Jellying of Fruits, Delaware Agricultural Experiment Station *Bulletin* No. 133. 1923.

Fat Protects Meat Against Freezer Burn

(Continued from page 87)

true of those samples dipped in tallow at 100 deg. F. and to a lesser degree those dipped at 150 deg. F. At the highest temperature of 200 deg. F. the tallow checked but did not chip off. The degree of chipping was directly related to the thickness of the covering. This checking effect was noted with 50 percent lard and 50 percent tallow and chipping for those covered by 25 percent lard and 75 percent tallow at 100 deg. F.

Lard as a covering material in the storage of frozen meats may have the disadvantage of imparting a rancid flavor if the storage period is too long or the temperature too high. It would appear that this objection could be overcome to a large extent by the use of a suitable antioxidant in the lard.

References

1. E. H. Callow, The Storage of Frozen Legs of Pork for Subsequent Manufacture of Hams. Report of Director of Food Investigations Board 1937 (British report).

2. Ruth M. Griswold and Leonard H. Blakeslee, The Effect of Different Wrappings, Temperature and Length of Storage on Keeping Qualities of Frozen Pork Chops, Record of Proceedings of 32d Annual Meeting of American Society of Animal Products, 1939.

3. George S. Jamieson, "Vegetable Fats and Oils," The Chemical Catalogue Co., Inc., New York, 1932, 44 pp.

4. A. E. King, H. L. Roschen and W. H. Irwin, An Accelerated Stability Test Using the Peroxide Value as an Index, *Oil and Soap*, Vol. 10, 105–109, 1933.

5. W. J. Loeffel and F. Yung, Study Protection of Meat From Dehydration During Quick Freezing, *The Locker Operator*, vol. 4, (4), 9, November, 1942.

6. T. Moran, Store-burn in Frozen Offal, Report of Director of Food Investigations Board, 1936 (British report).

7. Walter Stiles, Preservation of Food by Freezing—Fish and Meats, Food Investigations Board, Special Report No. 7, 1922 (British report).

CAN YOU TELL YOUR HACKNEY CONTAINERS APART?

PROBABLY not—for Hackney Containers of the same type not only look alike but *are* alike, inside and out.

Because uniform size, weight, strength and capacity are vitally important in avoiding costly losses and in helping to keep customers satisfied, the users of Hackney Barrels and Drums recognize uniformity as another important advantage built into the product by Pressed Steel Tank Company.

The *uniformity* of Hackney Containers starts with the chemical and metallurgical research that is utilized in the selection and testing of raw materials. And it is maintained throughout every step of their manufacture by modern heat-treating and quality-control equipment, which makes Hackney uniformity more than "skin deep."

"Tomorrow," the advantages of Pressed Steel Tank Company's product development work and volume manufacturing experience will be available to *every* concern.

To meet today's needs, Hackney Barrels and Drums can be furnished where priorities are obtainable. Write today for full details.

Pressed Steel Tank Company

MANUFACTURERS OF HACKNEY PRODUCTS

General Offices and Factory · 1457 SOUTH 66th ST.

Milwaukee 14, Wisconsin

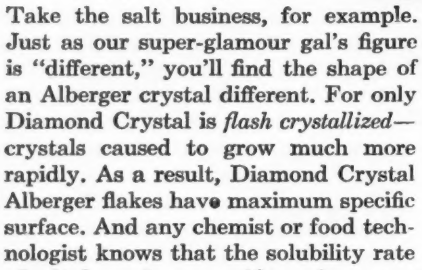
CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

Write today for full information

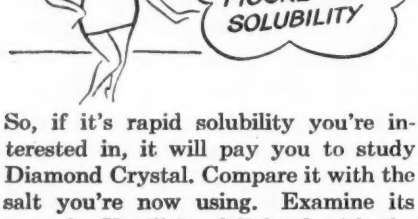
WE'VE AN EYE FOR "FIGURES"

WHO WINS the beauty contest? The lovely with the best figure. For she's the one the judges pick, when a bevy of pretty girls passes in review. Which just proves that the right kind of figure always makes a hit . . . that shape is often the measure of success.

Take the salt business, for example. Just as our super-glamour gal's figure is "different," you'll find the shape of an Alberger crystal different. For only Diamond Crystal is *flash crystallized*—crystals caused to grow much more rapidly. As a result, Diamond Crystal Alberger flakes have maximum specific surface. And any chemist or food technologist knows that the solubility rate of salt depends on specific surface more than anything else.



So, if it's rapid solubility you're interested in, it will pay you to study Diamond Crystal. Compare it with the salt you're now using. Examine its crystals. You'll be delighted with the results of your laboratory comparison, and equally pleased when you follow up with actual plant tests. Yes, a trial will convince you that the *right shape* puts Diamond Crystal out in front when it comes to rapid solubility.



NEED HELP? HERE IT IS!

If you have a salt problem, write to Technical Director, Diamond Crystal, Dept. J-7, St. Clair, Michigan. We'll be glad to advise you—or even send an experienced salt technician to your plant—without obligation to you.

DIAMOND CRYSTAL
ALBERGER PROCESS **SALT**

PATENTS

Potatoes Processed by Cooking to Granular State and, While at Cooking Temperature, by Subjecting to Dry Air With Gradual Increase in Temperature and Decrease in Humidity Until Moisture Content is Less Than 10 Percent—Ernest L. Nixon, State College, Pa. No. 2,339,028. Jan. 11, 1944.

Vegetable Phosphatides Decolorized by Treatment With Aqueous Solution of Sodium Chlorite—Robert Edman Greenfield, to A. E. Staley Manufacturing Co., Decatur, Ill. No. 2,339,164. Jan. 11, 1944.

Fruits and Vegetables Quick Frozen and Stored Without Discoloration Through Use of Invert Sugar Solution as Refrigerant—Robert B. Taylor, Knoxville, Tenn., to Tennessee Valley Authority. No. 2,339,300. Jan. 18, 1944.

Plastic Cheese Molded and Packaged in Receptacle Having Prefolded Container Formed From Single Flexible Sheet With Heat-sealable Coating—Charley L. Wagner, Menasha, Wis., to Marathon Paper Mills Co., Rothschild, Wis. No. 2,339,305. Jan. 18, 1944.

Toasted Cereal Food Pellet of Cylindrical Form Made of Finely Milled Bran and Edible Water-resistant Binding Material—Eugene H. McKay, Battle Creek, Mich., to National Biscuit Co., New York, N. Y. No. 2,339,418. Jan. 18, 1944.

Puffed Cereal Flakes Made From Soft Dough Containing Mixture of Cereal Flour, Sugar, Malt and Water—Eugene H. McKay, Battle Creek, Mich., to National Biscuit Co., New York, N. Y. No. 2,339,419. Jan. 18, 1944.

Filled Ice Cream Cones Mechanically Held in Upright Position With Spaced Relation to Each Other To Permit Coating on Volume Production Basis—Carl R. Taylor, Cleveland Heights, Ohio, to Cream Cone Machine Co., Cleveland, Ohio. No. 2,339,437. Jan. 18, 1944.

Meat Aged by Holding at About 60 Deg. F. in Humidified Air Containing Low Concentrations of Ozone to Inhibit Growth of Mold and Bacteria—Rudolph Nagy, Bloomfield, and Harvey C. Rentschler, East Orange, N. J., to Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. No. 2,339,507. Jan. 18, 1944.

Cakes Mechanically Cut Into Segments Which Are Subsequently Mechanically Separated From Each Other by Division Partitions and Protected With Wrappers Contacting Upper and Outer Edges of Partition and Outer Edge of Supporting Plate Without Coming in Contact With External Surfaces of Cake Sections—Orrie L. Rice, Wood-Ridge, N. J., to Milprint, Inc., Milwaukee, Wis. No. 2,339,584. Jan. 18, 1944.

Nuts Mechanically Cracked Without Damage to Nut Meats — Charles C. Wright, McMinnville, Ore. No. 2,339,596. Jan. 18, 1944.

Filled Cans Mechanically Tested to Detect Defects—Roy O. Henszey and Paul Smart, to Carnation Co., Oconomowoc, Wis. No. 2,339,638. Jan. 18, 1944.

Filled Cans Mechanically Tested to Determine Completeness of Cap Seal—Roy O. Henszey, to Carnation Co., Oconomowoc, Wis. No. 2,339,639. Jan. 18, 1944.

Dry, Free-flowing Foods Mechanically Treated to Destroy Insect Infestation—Franklin S. Smith, New Haven, Conn. No. 2,339,654. Jan. 18, 1944.

Food Preserved by Treatment With Aqueous Solution Containing 14 to 24 Percent of Butanedione—Albert Kiers and Roelof Jan Kiers, Ladue Village, Mo. No. 2,339,704. Jan. 18, 1944.

Flour and Like Material Mechanically Treated to Destroy Infestation—Franklin S. Smith, New Haven, Conn. Nos. 2,339,732; 2,339,733; 2,339,734; 3,339,735; and 2,339,736. Jan. 18, 1944.

Insect Infestation in Dry Flowable Foods, Destroyed by Mechanical Impact of Treated Material Upon Plate Surfaces—George E. Hulse, New Haven, Conn., to Safety Car Heating and Lighting Co., Inc. No. 2,339,737. Jan. 18, 1944.

Flour and Similar Milled Products Freed From Insect Infestation by Mechanical Impact of Rotor-impelled Particles Upon Imperforate Surfaces—Kurt H. Conley, Bridgeport, Conn., to Safety Car Heating and Lighting Co., Inc. Jan. 18, 1944.

Thinly Divided Potatoes Dried by Rapidly Heating With Predominantly Radiant Energy to Above 165 Deg. F. for Short Time and Lowering Temperature to Below 150 Deg. F. at Less Than Atmospheric Pressure—John M. Baer, Chicago, Ill., to Guardite Corp. No. 2,339,757. Jan. 25, 1944.

Fruit Packaged in Jars Under Manually Induced Vacuum—Bruno Mahlke, Kenosha, Wis., to Norman C. Gross, Milwaukee, Wis. No. 2,339,791. Jan. 25, 1944.

Liquid Fats Cooled to Below Solidifying Point While Being Maintained in Flowable Condition—Jacob Schaub, Westfield, N. J., to Best Foods, Inc., New York, N. Y. No. 2,339,883. Jan. 25, 1944.

Meat Tenderized by Mechanical Means—Hendrik Stukart, to U. S. Slicing Machine Co., La Porte, Ind. No. 2,339,890. Jan. 25, 1944.

Rennin Obtained From Acidified Animal Tissue—Havard L. Keil, Clarendon Hills, Ill., to Armour and Co., Chicago, Ill. No. 2,339,931. Jan. 25, 1944.

Mixtures of Unsaturated Fatty Acids With Improved Drying Properties Prepared From Fish Oil—John B. Brown, to Ohio State University Research Foundation, Columbus, Ohio. No. 2,340,104. Jan. 25, 1944.

Raw Sugar Beet Juice Defecated by Two-step Liming Treatment—Robert D. Kent, Evanston, Ill., to The Dicalite Co., Los Angeles, Calif. No. 2,340,128. Jan. 25, 1944.

Fruit Sugar-treated to Preserve Natural Color, Flavor and Texture—Augustus J. Rogers, Beulah, Mich. No. 2,340,145. Jan. 25, 1944.

Foods Dehydrated Under Vacuum—John M. Baer, Chicago, Ill., to Guardite Corp. No. 2,340,170. Jan. 25, 1944.

Hot Roasted Coffee Bean Treated with Cold Glycerinated Sugar Solution to Fill Surface Pores and Crevices Preliminary to Cooling—Mario P. Tribuno, Bayside, Long Island, N. Y. No. 2,340,235. Jan. 25, 1944.

Eggs Packaged by Coating With Rubber Hydrochloride Film—Albert B. Clunan, Barberton, Ohio, to Wingfoot Corp., Akron, Ohio. No. 2,340,260. Jan. 25, 1944.

Cereal Grains Freed From Exterior Bran Coat Laminations by Flotation—Theodore Earle, Pacific Palisades, Calif., to Continental Baking Co., Wilmington, Del. No. 2,340,313. Feb. 1, 1944.

Quick Frozen Foods Marked or Identified in Frozen State With Edible Anti-freeze Agent Which Loses Its Identity When Temperature Rises Above Predetermined Point—Robert P. McNaught, San Francisco, Calif., one-third to Catherine Marie Bastian and one-third to Ada Ann McNaught, San Francisco, Calif. No. 2,340,337. Feb. 1, 1944.

Coffee Bean Freed From Oil Which is Fractionated, Reimpregnated With Oleic and Linoleic Fractions of Extracted Oil, and Subjected to Heat, Pressure, Mineral Acid and Continuous Supply of Steam for Removal of Furfural and Formation of Coffee Bean Plastic—Herbert S. Polin and Albert I. Nerken, New York, N. Y., to Herbert S. Polin. No. 2,340,426. Feb. 1, 1944.

Chocolate Cast by Rotatable Mechanism Having Number of Spaced Cylinder Bores Opening at Its Circumference and Discharging Through Piston Action in Cylinder Bores—Kai Christian Sophus Aasted, Gentofte, near Copenhagen, Denmark, to Alien Property Custodian. No. 2,340,501. Feb. 1, 1944.

Casings Removed From Sausages and Picnic Loaves by Mechanical Means—Parker A. Jacobson, Evanston, Ill. No. 2,340,755. Feb. 1, 1944.

Ground Roasted Coffee Extracted to Give Concentrate — William Kappenberg, Queens Village, and Frank J. Rameh, New York, N. Y., to Coffee Products Corp., New York, N. Y. No. 2,340,758. Feb. 1, 1944.

Empty Carton on Packaging Line Rejected by Jet of Air Not Strong Enough to Reject Filled Carton—Donald J. Snyder, Chicago, Ill., to General Mills, Inc. No. 2,340,775. Feb. 1, 1944.

Liquids Sterilized by Irradiation With Ultraviolet While Passing Under Pressure Through Treating Unit—Alphonse Lang and George S. Hawke, Cincinnati, Ohio. No. 2,340,890. Feb. 8, 1944.

Zein Subjected to Heat and Solvent Action to Form Substantially Anhydrous Plastic Mass—Harry M. Weber, Chicago, Ill., to American Maize-Products Co., New York, N. Y. No. 2,340,913. Feb. 8, 1944.

Coffee Beverage Concentrate Made by Homogenizing Mixture of Coffee Extract, Milk and Sugar—Bernard Salkin, New York, N. Y. No. 2,340,989. Feb. 8, 1944.

Vegetables Subjected to Action of Heat and Pressure in Presence of CO_2 and Cooled Without Contact With Air Preparatory to Dehydrating—Balint Moskovits, Budapest, Hungary, to Alien Property Custodian. No. 2,341,152. Feb. 8, 1944.

Animal Carcasses Protected Against Surface Moisture Changes by Coating With Cloth Boiled in Water to Remove Sizing and to Give Wicking Properties—Beverly E. Williams, to Industrial Patents Corp., Chicago, Ill. No. 2,341,199. Feb. 8, 1944.

Skimmed Milk Mixed With Dispersing Agent Such as Tetrasodium Pyrophosphate and Sodium Metaphosphate and Heated to Substantially 60 to 70 Deg. C. for About 2 Hr. With Acid Reaction and Subsequently at 70 to 80 Deg. C. for Approximately 2 Hr. With Neutralization to Form Colloid—Clayton Clifford Curry, Wilmington, Del., to Research and Development Corp., Wilmington, Del. No. 2,341,425. Feb. 8, 1944.

Sausage Meat Forced Into Casings Through Action of Compressed Gas—Karl Götzinger, Ternitz, N. D., Germany, to Alien Property Custodian. No. 2,341,609. Feb. 15, 1944.

Blended Green Coffee Berries Subjected to Ultra-violet for Approximately 6 Min. to Reduce Chlorogenic Acid Content and to Give All Portions of Blends Substantially Identical Taste—Daniel Joseph Kennedy, Vancouver, British Columbia, Canada. No. 2,341,723. Feb. 15, 1944.

Green Coffee Chilled to at Least 32 Deg. F., Moistened and Subsequently Subjected to Ultraviolet for Over 2 Min.—Daniel Joseph Kennedy, Vancouver, British Columbia, Canada. No. 2,341,724. Feb. 15, 1944.

Meat Curing Brine Containing Bacteria and Meat Proteins Regenerated by Subjection to Steam at High Temperature for a Few Seconds and Centrifuging to Remove Coagulum—George Grindrod, Oconomowoc, Wis., to Grindrod Process Corp., Dover, Del. No. 2,341,769. Feb. 15, 1944.

Mixture of Roasted Coffee and Chicory Improved by Addition of 0.25 to 1.0 Percent of Acid Salt of Alkaline Earth Metal—Frank J. Stayton, Birmingham, Ala. No. 2,341,826. Feb. 15, 1944.

Fruits Pitted by Mechanical Means—Edward P. Drake and Fred J. Alberty, Los Angeles, and William Herbert Kagley, Lindsay, Calif., to Lindsay Ripe Olive Co., Lindsay, Calif., No. 2,341,857. Feb. 15, 1944.

Potatoes Washed and Dried to Retard Decay During Shipment—James W. Morse, Lansing, Mich., to Food Machinery Corp., San Jose, Calif. No. 2,342,007. Feb. 15, 1944.

Canadian Patents

Malt or Malt Extract Dispersed Homogeneously Throughout Fat to Form Solidified Product With Inhibited Fermentation Properties—Leo Gurwitsch, Liverpool, England. No. 418,474. Feb. 22, 1944.

MOTOCO *Indicating Thermometer Model F-1 $20. Shown with capillary tubing for remote reading.*

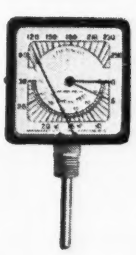
YOU BENEFIT 4 WAYS WITH

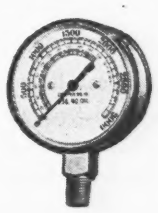
MOTOCO

INDICATING THERMOMETERS

1. Absolute accuracy of temperature indication...
2. No intricate mechanism to get out-of-order...
3. Low cost, due to specialization and large-scale production...
4. Remote reading—temperature observation can be made at some distance from where temperatures are taken.

These four features recommend MOTOCO Indicating Thermometers for use wherever uniform temperature is required to maintain quality and avoid waste in processing. Write for full information on money-saving, time-saving MOTOCO temperature indication.





Illustrated here are two of the many types of MOTOCO *precision instruments made for specific industrial applications. Left: Combination Thermometer, Pressure and Altitude Gauge. Right: Pressure Gauge used in oxy-acetylene welding.*

THE ELECTRIC AUTO-LITE COMPANY

MOTO METER GAUGE AND EQUIPMENT DIVISION

CHRYSLER BUILDING, NEW YORK 17, N. Y.

In addition to a wide range of thermometers and gauges, MOTO METER specializes in the production of instruments of special design for use as a standard part of manufacturers' equipment.

Even under fire our soldiers

get their daily quart of milk!

Wherever our fighting men go, their K ration kits supply them with their daily milk supply . . . in the form of cheese packed in 4 ounce cans!

It takes 10 pounds of milk (5 quarts) to make one pound of American Cheddar Cheese . . . so each of these 4 ounce cans contains the essential food values of a quart plus an additional glass of milk.

The Plymouth, Wisconsin, Plant of the Lakeshire-Marty Co., Division of The Borden Company, packs millions of pounds of Pasteurized Processed Cheese in sturdy, easy-to-open cans supplied by Crown. In all parts of the world, our fighting forces are getting their "quart of milk each day" . . . in the form of cheese . . . thanks to these Crown Cans that protect the contents from the Wisconsin plant all the way to the front!

One more reason why the men and women of Crown take extra pride in their job of making the containers that serve our fighting men!

CROWN CAN COMPANY, New York • Philadelphia
Division of Crown Cork and Seal Company, Baltimore, Md.

★ ★ ★ CROWN CAN

FOOD TECHNOLOGY
NEW DISCOVERIES AND INVENTIONS

STORAGE

Blast Freezing

MOISTURE content of saturated air becomes more nearly constant as the temperature decreases, so that for a given rise in the circulating air temperature during freezing there will be less removal of water from the material being frozen as the temperature range is lowered. The amount of air required to be circulated for a given freezing load increases as the temperature is lowered, but at a much smaller rate than the decline in moisture pickup.

From the curves of these two factors, moisture content and freezing capacity (heat content) of the air, it is possible to pick a range of temperature within which the drying effect will be almost negligible while the increase in cost due to increased volume of circulating air will be balanced by the advantage obtained through absence of shrinkage, savings in space and handling, and improved quality of the product. This temperature range lies in the vicinity of minus 30 deg. F. for the conditions of design chosen by the author, 250-ft.-per-minute face velocity across the product.

By operating within this temperature range it is possible to obtain the advantages of even temperature distribution throughout the freezing chamber and rapid removal of heat from the product which are possible with forced air circulation. Cross-circulation of air in a tunnel type freezer is recommended.

In a test cited, 44,000 lb. of turkeys was frozen in 9 hours, at an average temperature of minus 32.8 deg. F. The tunnel was 17 by 52 ft. Air velocity was 250 ft. per minute, with a total air volume through the blowers of 80,000 cu. ft. per minute.

Circulation of the air lengthwise of the tunnel would have required fan equipment for only one-third the air volume for the same freezing time. But the air-temperature range would have been three times as great, requiring much lower temperatures in the refrigerator cooling coils, and the product at the outlet end of the tunnel would be frozen at a higher temperature range and so subject to desiccation.

In this test, the shrinkage loss was 0.334 percent for 17- to 25-lb. turkeys, each wrapped separately in a single sheet of kraft paper and packed three in a box. Some chickens frozen unwrapped, for comparison, gave a shrinkage loss of 0.39 percent, which is close to the theoretical for the conditions of operation. All birds were in excellent condition, without any evidence of drying out.

Figures are given to show that increased air velocity at a higher temperature, such as minus 15 deg. F., would not give more economical operation.

Digest from "The Case for Blast Freezing of Poultry and Other Shrinkable Food Products," by J. E. Watkins, *Ice and Refrigeration*, vol. 105, 93–97, September, 1943.

CEREAL PRODUCTS

Fermentation Inhibitors

INHIBITION of alcoholic fermentation by purothionin, a protamine toxic to yeast, probably accounts for some cases of low alcohol yields from wheat. This may occur whenever "granular flour" is used instead of whole wheat, but present methods of mashing and fermentation usually eliminate the trouble.

Laboratory-scale fermentation experiments with purothionin, as a crystalline protamine hydrochloride, have been made to discover the mechanism of the interference and ways to avoid it. The toxicity appears to be due to the arrangement of the amino acids in the molecule, and any operation which breaks down the molecular arrangement also destroys the toxicity.

In the usual fermentation heating and proteolysis by enzymes in the malt accomplish this.

In sterilized malt wort 50 μg per milliliter of purothionin hydrochloride prevented fermentation at a pH of 5.28 and initial yeast count of 28×10^6 cells per milliliter. Treatment of the wort with trypsin for 3 hours at 95 deg. F. and pH 5 permitted vigorous fermentation even with 20 times this concentration of purothionin.

Fermentation tests with wheat flours, without added purothionin, clearly showed the presence of an inhibitor. Whole wheat, containing proteinase from the bran, fermented very well, even with a cooking temperature of 176 deg. F. for 1 hour, but 85 percent extraction granular flour had to be heated to 212 deg. F. to obtain any appreciable fermentation. Fermentation was much more rapid and complete after autoclaving at 15 lb. per square inch.

In a final series of experiments, presence of uncooked granular flour prevented the fermentation of dextrose added with yeast but no malt. With about 10 percent dextrose in the mash and a yeast concentration of 34×10^6 cells per milliliter, results expressed as loss of carbon dioxide after 46 hours fermentation, were:

Uncooked granular flour.....0.8 g.
Cooked 1 hr. at 176 deg. F.....1.4 g.
Cooked 1 hr. at 212 deg. F.....4.1 g.
Autoclaved 1 hr. at 15 p.s.i.....9.2 g.

Trypsin digestion of the uncooked flour and dextrose for 16 hours at 98.6 deg. F., with pH 8.0, before inoculation with the yeast gave 9.1 g. loss of carbon dioxide after 44 hours.

Digest from "The Inhibitory Effect of a Protamine from Wheat Flour on the Fermentation of Wheat Mashes," by A. K. Balls and T. H. Harris, *Cereal Chemistry*, vol. 21, 74–79, January, 1944.

PLANT MANAGEMENT

Waste Fat Recovery

WASTE fat is a problem in many food handling and processing plants. Recovery should be made before the fats or oils get into the waste water system, as complete recovery is not possible after the fats have been mixed with the water, while the fats recovered will not be of as high quality as the original. However, where fat- or oil-bearing materials are handled, some fat will get into the water going to waste. Recovery will be of direct financial advantage and will also prevent trouble from blocked sewers, stream pollution and interference with sanitary waste treatment facilities. Proper selection of a recovery system depends on the determination of the quantity of recoverable fats in the waste water.

In a settling tank or catch basin, where separation depends on retarding the rate of flow, there will be an upper layer rich in fat materials, a special zone containing only those solids with a specific gravity near that of water (including emulsified fats) and a bottom layer or sludge of inorganic material with some heavier fat-bearing substances and absorbed fat. The fat in

LUNKENHEIMER VALVES
whatever type.. mean better service

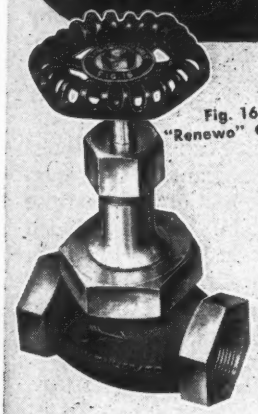


Fig. 16
"Renewo" Globe

In the heavy duty that Lunkenheimer Valves are doing on every front—industrial, maritime, army and navy, chemical, petroleum, synthetic rubber—a prime attribute is lasting quality . . . that inherent quality that comes of correct engineering, simplicity of design, and "know-how" manufacturing born of long experience.

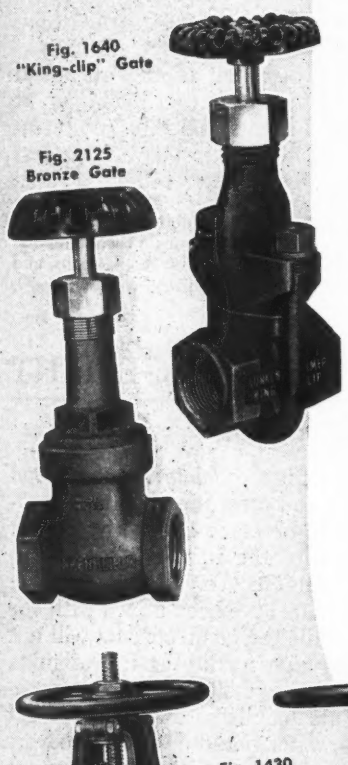


Fig. 1640
"King-clip" Gate

Fig. 2125
Bronze Gate

These features in Lunkenheimer Valves are proving a boon to maintenance crews, in uninterrupted performance, low maintenance expense, and ease in making necessary repairs . . . in short, better service.

Let your Lunkenheimer distributor help you with your maintenance, repair and operating problems. His facilities and experience are at your call. Lunkenheimer Catalog 78 available on request.

ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI 14, OHIO. U. S. A.
NEW YORK 13 CHICAGO 6
BOSTON 10 PHILADELPHIA 7
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK 13, N. Y.

SIMPLICITY OF DESIGN
MEANS EASIER MAINTENANCE

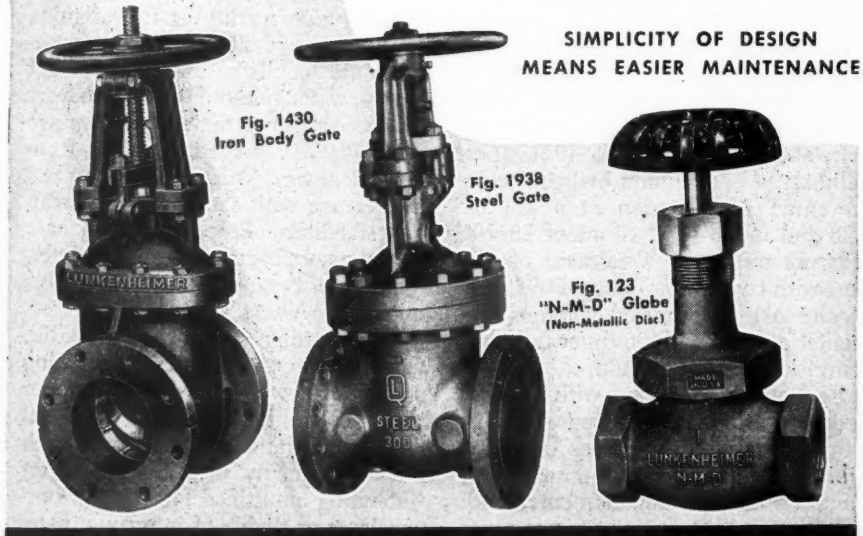


Fig. 1430
Iron Body Gate

Fig. 1938
Steel Gate

Fig. 123
"N-M-D" Globe
(Non-Metallic Disc)

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.;
BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

the top layer is recoverable by ordinary means. That in the other two zones can be recovered only by special chemical or mechanical treatment. A sampling method, therefore, should separate the layers, to permit determination of the recoverable fat.

The author uses a 55-gal. drum with an overflow pipe attached at the bottom and carried up outside the drum to the water level. Waste samples are poured in at the top through a large funnel. The drum is filled with clear water to start, and five 1-gal. samples from different points of the waste system are added to the drum every five minutes, giving a throughput of 1 gal. a minute, a flow of less than 1 ft. a minute, and a detention time of 60 minutes. At the end of the test period all floating material is skimmed from the drum and analyzed for total fat. Stream flow during the test period is measured with a weir so that the total loss of recoverable fat can be calculated from the ratio of total flow to volume poured through the test drum and the weight of the fat recovered.

Digest from "Determining Recoverable Fat Losses in Plant Waste Effluents," by E. N. Mortenson, *Oil & Soap*, vol. 21, 57–59. February, 1944.

BAKING

Quality Control In Cracker Baking

CRACKER bakers have an interesting problem in controlling the alkalinity of their product. Proper texture, flavor and appearance all depend on the pH, which must be within the range of 7.2 to 8.4 in the baked cracker.

The pH cannot be controlled by additions to the dough before fermentation, since organic acids which must be neutralized are formed during an 18-hour fermentation period. The quantity for each batch depends on the flour characteristics, and dough-trough conditions, as well as the temperature, humidity and time of fermentation. The amount of bicarbonate to be added is judged on the basis of the rise in temperature during fermentation.

Below pH 7 there is little change in pH during baking, but above this point there is an abrupt rise, so that large increases of pH result from small increments of sodium bicarbonate. There is indication of reactions during baking involving formation and breakdown of alkali-protein-acid complexes and conversion of excess alkali to normal carbonate.

Diammonium phosphate is an effective buffer when added with the bicarbonate. Interpolating from the curves presented by the authors, 0.25

ercent of this buffer held the pH thin relatively narrow limits, the ontrol giving pH values of 5 to more an 9, and the buffered product 5.4 8. Or, the control permitted a varia- on from 0.34 to 0.48 percent, approx- ately, in added bicarbonate to hold e product within the desired range, hile the buffered doughs were satis- ctory with bicarbonate from 0.56 to ell over 8 percent. This increase in lerance is important in maintaining niformity of quality.

Digest from "pH Variations in Soda Crackers d Their Control with Diammonium Phos- hate," by E. A. Vaupel and W. Hanks, *ereal Chemistry*, vol. 21, 16–27, January, 944.

DAIRY PRODUCTS

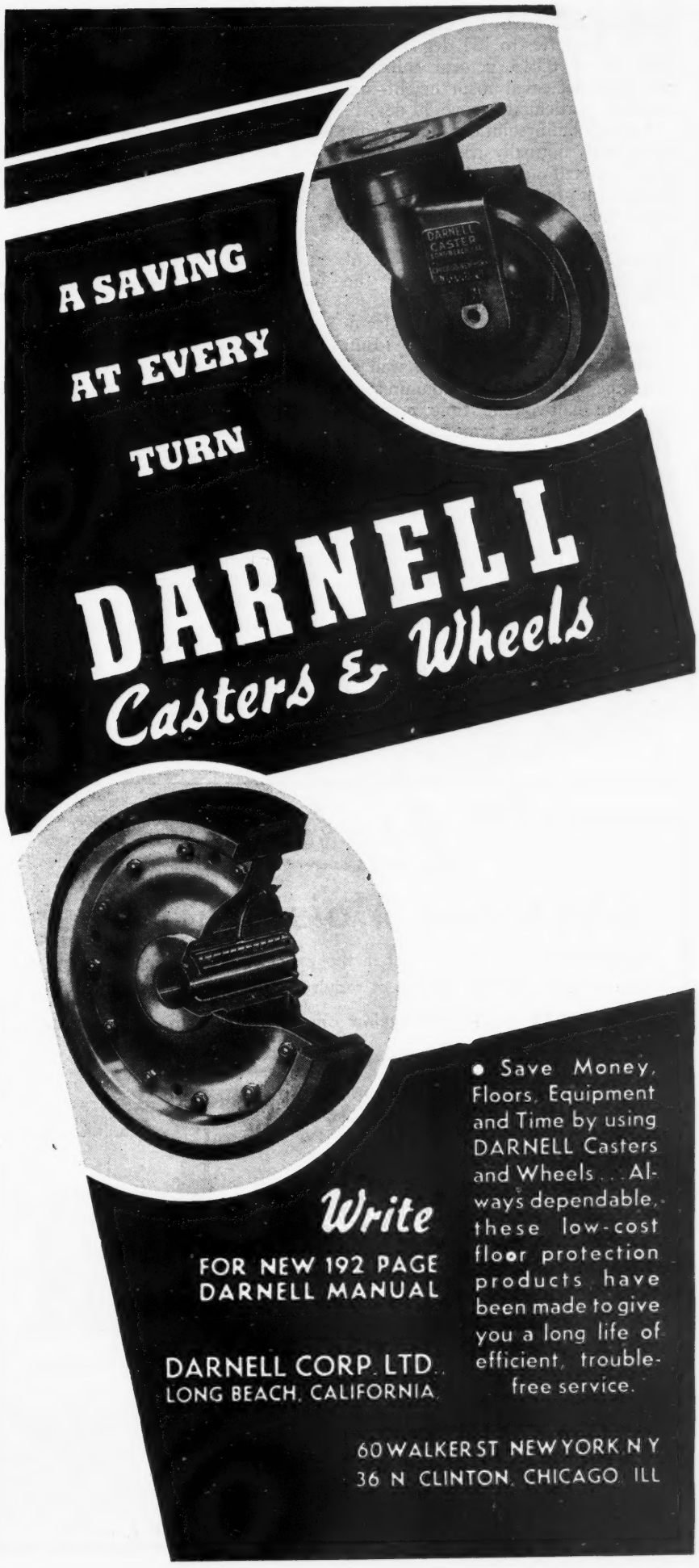
Foaming Influenced By Milk Proteins

CHURNING of cream, shrinkage of ice ream, whipping of cream or con- ensed milk, prevention of milk solids osses in manufacturing processes, oaming of casein in paper coating, nd the efficiency of pasteurization are isted by the author as practical prob- ems directly related to foaming.

For the purposes of this study a oam measuring apparatus was used in which a known volume of air can be orced at a measured pressure through a fitted glass disk into a layer of liquid. Provision is made for separating the foam from the liquid. A water jacket permitted tempering the sample at any desired temperature. A sample volume of 50 ml., with air forced through for 20 seconds from a storage tank under 5 lb. per square inch against a manom- eter pressure of 30 mm. of mercury, was used. The height of the foam was read immediately after shutting off the air pressure. A more accurate measure of foam stability was found to be the time, expressed in seconds, required for the foam to subside to one-half the original height.

The study included the effect of casein, lactoglobulin and lactalbumin. Casein was prepared with 0.09 percent fat by super-centrifuging skimmilk, pre- cipitating with hydrochloric acid, wash- ing very thoroughly, and dehydrating the casein from the frozen state. This casein contained about 41.5 percent total solids and 40.2 percent proteins. Lactoglobulin, without fat, was pre- pared from the whey obtained from the super-centrifuged skimmilk.

Solutions of each of these milk con- stituents were tested for foaming char- acteristics. Low temperature and low fat content favor the stability of cal- cium caseinate foam. Stability in- creases slightly with temperature up to about 71 deg. F., then starts to decline


A SAVING
AT EVERY
TURN
DARNELL
Casters & Wheels
Write
FOR NEW 192 PAGE
DARNELL MANUAL
DARNELL CORP. LTD.
LONG BEACH, CALIFORNIA
• Save Money, Floors, Equipment and Time by using DARNELL Casters and Wheels . . . Always dependable, these low-cost floor protection products have been made to give you a long life of efficient, trouble-free service.
60 WALKER ST NEW YORK N Y
36 N CLINTON, CHICAGO ILL

slowly at first up to 95 deg. F., and rapidly thereafter to 131 deg. F. The addition of 0.015 percent milk fat emulsion decreased foam height and stability, particularly above 59 deg. F.

Lactoglobulin solutions in the concentrations normally present in milk (0.05 percent) did not foam at any temperature tested, in the presence of about 0.006 percent fat. Foam height and the stability increased at all temperatures tested, when the fat content was decreased to 0.001 percent, the increase being greater at temperatures above 68 deg. F. None of the lactoglobulin solution gave stable foam. Lactalbumin solution foamed well at all temperatures. For lactalbumin solution the half-volume time increases sharply with rise of temperature from 41 to 72 deg. F., and then remains very high above that. Addition of as little as 0.005 percent fat greatly decreases the foam stability at temperatures below 77 deg. F., but has no effect above 100 deg. F.

On the basis of these findings solutions containing calcium caseinate lactalbumin and milk fat emulsion in phosphate buffer were prepared, which approximated the foaming properties of skimmed milk. It is concluded that calcium caseinate is the foaming substance of milk at low temperature, while lactalbumin is the substance contributing to the foam at temperatures above the melting point of the milk fat.

Digest from "The Role of Surface-Active Constituents Involved in the Foaming of Milk and Certain Milk Products. I. Milk Proteins, and II. Whey, Skimmed Milk and Their Counterparts," by M. S. El-Rafey and G. A. Richardson, *Journal of Dairy Science*, vol. 27, 1–31, January, 1944.

DEHYDRATED FOODS

Vitamin and Color Loss

In dehydrated unblanched spinach, color changes due to conversion of chlorophyll to pheophytin are accelerated as the moisture level increases and are independent of storage atmosphere. Blanching before dehydration markedly increases the conversion. The change is one of acid hydrolysis.

Carotene destruction in the unblanched dehydrated vegetable is independent of moisture level and markedly influenced by storage atmosphere. Blanching stabilizes the carotene. This change is oxidative.

In the absence of oxygen the destruction of vitamin C proceeds at a rate comparable to that of the conversion of chlorophyll, while in atmospheres containing oxygen this vitamin is destroyed at a much greater rate than is chlorophyll. Taste and flavor lo always accompanies the discoloratio due to conversion of chlorophyll, bu may occur much more rapidly so tha poor taste can develop in sample which still retain a good green color.

Analytical methods are reporte which permit determination of chloro phyll, pheophytin, xantophyll an carotene on a single sample.

Digest from "Dehydrated Spinach, Change in Color and Pigments during Processing an Storage," by H. J. Dutton, G. F. Bailey and J Kohake, *Industrial and Engineering Chemistry* vol. 35, 1173-77, November, 1943.

FATS AND OILS

Antioxidants Patented

The work of Mattill and Golumbic on antioxidants for fats and oils having no discrete aqueous phase has resulte in a series of patents which cover their preferred antioxidant materials in various mutually helpful combinations. These include an ascorbic acid plus a tocopherol-type compound selected from the hydroxychromans, tocopherols, alkyltocols, hydroxycoumarans, hydroxycoumarones, hydroxyisocoumarones and chroman-5, 6-quinones and their precursors which are related to vitamin E. To these the

The Steinlite.

Electronic Moisture Tester

FAST Makes a moisture test in the process of dehydrating foods in one minute—not 30 minutes as required by other testers.

ACCURATE Calibrated against official government oven methods.

EASY TO USE Like tuning a radio.

LOW UP KEEP Consumes approximately as much electricity as a 60 watt bulb.

POPULAR Over 4,700 in use.

BE SMART; ORDER NOW . . . for immediate shipment or for shipment within a 60 day period ahead of your busy season. Avoid delays and disappointments. No down payment. Free trial.

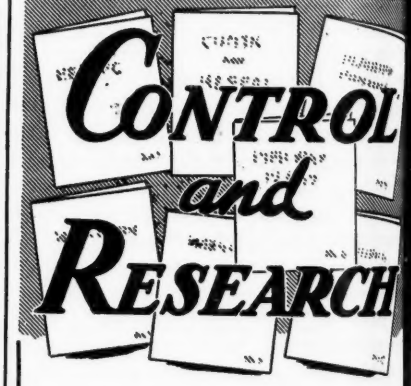
The STEINLITE One Minute Moisture Tester.

Seedburo—"HEADQUARTERS" for all Grain and Seed Testing Equipment.

SEEDBURO EQUIPMENT COMPANY

Seedburo Quality — Formerly Seed Trade Reporting Bureau — Founded 1912

634 BROOKS BUILDING CHICAGO 6, ILLINOIS



YOUR problems today are those of war . . . tomorrow the competitive developments of peace. We are prepared to assist you along both lines and will be glad to work with you on any matter requiring the services of an independent laboratory of established reputation and broad experience.

FOOD ANALYSIS
VITAMIN DETERMINATION
Biological - Microbiological - Chemical
NUTRITIONAL STUDIES - RESEARCH
PRODUCT DEVELOPMENT
BACTERIOLOGICAL STUDIES
CONSULTATION (Labeling, Advertising)

We perodically issue Brochures on the latest scientific developments in connection with our Research work.

Send us your name, title, company address and we will be glad to add your name to our mailing list.

An Independent Laboratory to meet the needs of Your Organization

LEBERCO LABORATORIES

36 Roosevelt Avenue, Bloomfield, N.J.

gentees may add a small amount of phthols, quinones and quinols. One patent covers use of caffeic acid, d another hexuronic acid with qui-nes, quinhydrones and naphtho-droquinone.

Digest from U. S. Patents 2,333,655, 2,333,-6, 2,333,657 and 2,333,658, issued Nov. 9, 43, to H. A. Mattill and C. Golumbic and igned to Lever Bros., Cambridge, Mass.

OOD CHEMISTRY

rotein Hydrolysis Made More Efficient

HEN hydrolysis of organic com-unds, especially proteins, is carried t at a fixed oxidation-reduction tential, it prevents interference by idation or reduction products either the original protein or of the hy-olysis products. Such a process re-ntly has been patented.

The patentee mentions soybean eal, sugar beet residues, albumin and sein as sources of amino acids.

In the presence of a readily oxi-zable and reducible material which ts as a buffer and holds the reaction ixture to the desired oxidation-reduc-on potential, hydrolysis proceeds ormally as a time-temperature reac-on. The yield of amino acid is con-stent and reproducible from batch to tch. The products are in an easily coverable form .

The oxidation-reduction potential n be maintained with multivalent in-rganic compounds such as vanadium nd manganese salts; organic material ore easily oxidized and reduced than e protein, as, for example, quinhy-rone; or by use of mixtures of oxi-zable metal and hydrogen-reducible etal compounds. Of these possible gents the latter is preferred, and the laims specifically cover only lead plus ead oxide or an alkali plumbate.

Sulphur compounds contaminating e protein are eliminated or rendered ondeleterious.

The reaction is conducted at 100 to 00 p.s.i. and approximately 284 to 92 deg. F. The reacted mixture is ooled in the sealed reaction vessel and hen cool the pressure is down to inus 10 to 15 in. of mercury.

The lead is precipitated out with hy-rogen at elevated temperatures, and e amino acids are recovered from the lkaline filtrate.

A second patent covers the protein ydrolysis carried out in the same way, ut with an "organic alkali," such as n amine, substituted for part or all of e caustic alkali in the reaction mix-ure. The patentee states that any mine or mixture of amines may be sed. Ethylene diamine is mentioned.

Mechanical Force for the Control of Flour Mill Insects

A Full 100% Kill

Mechanical Treatment Destroys Insects in Foods

How Millers Are Waging

WAR ON INFESTATION

● *Above are typical news headlines which have appeared in connection with reports on the "ENTOLETER" and its destruction of all forms of insect life in flour mills and food plants.*

Good News
is Being Made by
ENTOLETER
INFESTATION DESTROYER
REG. U. S. PAT. OFF.

"ENTOLETER" shown above handles 15,000 lbs. per hour. Others available to handle 2,000, 5,000 or 10,000 lbs. per hour.

What do users say about "ENTOLETER" performance in their mills after months of experience? What have exhaustive, independent tests of "ENTOLETER" efficiency proved? The answers are the facts that have made "ENTOLETER" *good news* for food processors everywhere.

The "ENTOLETER" is the new, positive method of insect control. It completely *destroys* all insect eggs and *other forms of insect infestation* and is a simple, *continuous* method of controlling infestation in flour, meal and similar free-flowing dry materials.

"ENTOLETERS" are in service in plants where these food products are manufactured: Soft Wheat Flour; Hard Wheat Flour; Durum Flour; Soya Flour; Cake Flour; Graham Flour; Pancake Flour and Ingredients; Corn Flour; and Whole Wheat Flour; also for Soya Grits; Soya Meal; Semolina; Powdered Soups; Cereals; Corn Meal; Farina; Brewers' Grits; Brewers' Yeast; Wheat Germ; Muffin Mixes and various other mixes. Write to us for free reports of independent tests. ENTOLETER DIVISION, The Safety Car Heating & Lighting Company, Inc., 230 Park Avenue, New York 17, N. Y.

ENTOLETER
INFESTATION DESTROYER
REG. U. S. PAT. OFF.

CONTINUOUS DESTRUCTION OF ALL INSECT LIFE

INFORMATION
NET CONTENTS 28 OZS. (AVOIR.)
LO-BAX
A CONCENTRATED CHLORINE BACTERICIDE TO AID DAIRYMEN IN MAINTAINING
LOW BACTERIA COUNTS
ACTIVE INGREDIENT CALCIUM HYPOCHLORITE . . . NOT LESS THAN 50%
INERT INGREDIENTS . . . . . NOT MORE THAN 50%
AVAILABLE CHLORINE 50%
The MATHIESON ALKALI WORKS (Inc.)
60 EAST 42ND STREET NEW YORK, N. Y.

FOR BETTER FOOD PLANT SANITATION

For efficient, economical food plant sanitizing, use Lo-Bax, the fast-killing chlorine bactericide. Containing 50% available chlorine, Lo-Bax retains its full strength far beyond the normal period of use. Dissolves quickly in hot or cold water . . . makes clear chlorine rinse solutions . . . kills germs almost instantly on contact . . . no need for scalding temperatures as with steam or hot water.

Write today for full information on Lo-Bax for better food plant sanitizing.

Mathieson
LO-BAX
CHLORINE BACTERICIDE

MATHIESON ALKALI WORKS (Inc.) 60 EAST 42nd STREET, NEW YORK, N. Y.
Lo-Bax . . . Super-Nufos . . . H T H-15 . . . Dry Ice . . . Carbonic Gas . . . Ammonia, Anhydrous & Aquq . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Liquid Chlorine . . . Bleaching Powder . . . PH-Plus . . . Synthetic Salt Cake . . . Sodium Chlorite Products . . . Sodium Methylate

Enough amine is used to react wit the amino acids produced and enoug caustic alkali to give a good rate o hydrolysis.

Digest from U. S. Patents 2,334,986 an 2,334,987, issued Nov. 23, 1943, to F. C. Be worth, and assigned to The Martin Dennis Co Newark, N. J.

STABILIZERS

Chocolate Plasticizer

A RUSSIAN investigator recommend addition of 0.1 percent of triethano amine to chocolate preparations, ac cording to *Chemical Abstracts*.

Small additions of this materia lower the viscosity of a chocolate prepa ration, reaching minimum viscosity a 89.6 deg. F. with 0.1 percent added Increasing the amount of added ma terial to between 0.3 and 0.5 percen increases the viscosity. Lecithin ha more effect in lowering the viscosity o the chocolate. Both raise the viscosit of cocoa butter, triethanolamine mor than lecithin.

Addition of 0.1 percent of triethanol amine kept chocolate in good condi tion in storage at 46.4 to 60.4 deg. F and 50 to 65 percent humidity for months. Lecithin and triethanolamin stearate did not.

Digest from L. A. Voroshilova and N. S Pisarev, *Trudy Vsesoyuznogo Nauchno-Issle dovatel'skogo Instituta Konditerskoi Promy shlennosti*, 1941, No. 4, 78–105, through *Chemical Abstracts*, vol. 37, 5798, Oct. 1 1943.

Agar Substitute

TASTE tests on canned precooke chicken and determinations of jell strength indicate that Irish moss ca replace agar as a jelling agent.

Gelose is obtained from the Iris moss by extraction in hot water. Thi extract has an undesirable color, odo and taste, but treatment with activate charcoal and filtration through dia tomaceous earth removes all odor an taste and most of the color.

Drying presented no difficulties, pro vided the heat was not excessive. Tun nel drying at approximately 200 t 225 deg. F. produced sheets slightl charred in spots. Satisfactory sample were prepared on laboratory drum an spray dryers and in a tunnel.

Gel strength is somewhat less wit Irish moss than with agar, for th same amount of jelling agent added The presence of small amounts o potassium salts brings up the strengt of the Irish moss jellies to that of th equivalent agar jellies.

Digest from "Investigations on the Use o Irish Moss in Canning of Meat," by E. J Reedman and L. Buckby, *Canadian Journal o Research*, vol. D 21, 348–57, November, 194

Questions and Answers

Dehydrated Cream

New York—We understand that there are now a few manufacturers who make "cream powder" or dehydrated cream. Can you supply addresses of the makers of this product, which we need for a certain manufacturing process?

At present only a very small quantity of cream is being dehydrated, if any, and that is going to the government for experimental purposes. The manufacture of dehydrated cream comes under the restrictions on butterfat, and it is not probable that there will be any available for civilian use until the butterfat restrictions are removed.

The product has in the past been used by candy manufacturers, as it contains 72 percent butterfat, with very good keeping qualities which offset its higher price. Production has never been large, 673,000 lb. being reported in 1928 and only 80,000 in 1932.

Compression by Extrusion

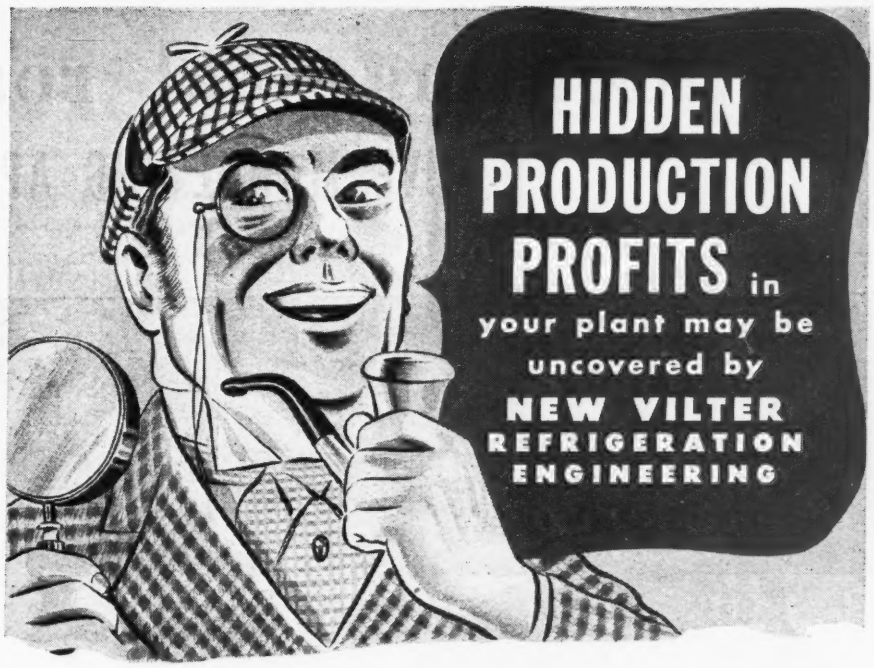
Illinois—"Do you have any information available as to what, if any, foods are compressed by the extrusion process?"

The alimentary pastes, such as macaroni and spaghetti, are the only food products we know which are compressed by extrusion, although a great number of products, such as butter and lard, are extruded to put them in a convenient shape for packaging. In the Vacu-Dry process of dehydrating fruits described elsewhere in this issue, an extrusion-compression process is used prior to dehydration.

Soybeans

New Zealand—Our factory, built for the dehydration of stone fruit and apples, is in operation for only a portion of the year, and we are considering producing other lines to extend our operating season. The climate is suitable for growing seeds and vegetables. We would like some information regarding the commercial possibilities of processing soybeans.

A number of canners in this country have been experimenting with the idea of canning green soybeans, but the difficulties due to flavor do not seem to have been overcome. The function of the soybean seems to be to supply oil and a flour which can be used in various types of baked items.



TUCKED AWAY in your plant, we believe, are many production methods that can be improved by "the proper application of proper refrigeration."

THE IMPROVEMENT of these methods will add to your income. And in many ways, such as reducing the amount of labor needed for maintenance, the amount of time required to keep your plant neat, and more often than not, turning what is now a waste material into a packageable product that can be marketed.

THE TRICK is to find the production methods in your plant, that need improvement. Now, don't sit back smugly and say "our production methods are as perfect as modern engineering can make them." Vilter engineers have turned this trick many times already, perhaps for some of your competitors. They know where to look and what to look for.

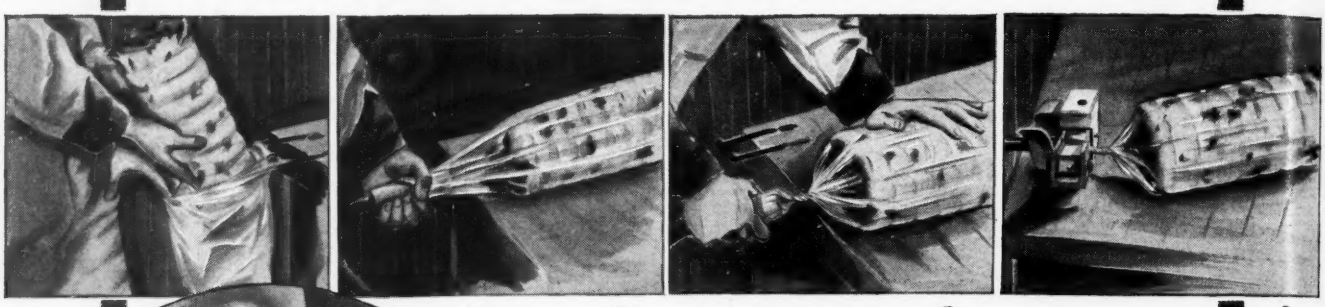
WE SUGGEST that you find out now what the boys up here in Milwaukee have that will materially aid your post-war sales strategy. Because the "proper application of proper refrigeration" is definitely a post-war *must* for all food processors. Please write directly to the main office on this subject.

Superior Since 1867 VILTER Air Conditioning Refrigeration

VILTER MANUFACTURING COMPANY
2115 South First Street Milwaukee 7, Wisconsin

Molding veal roasts . . .

TO GIVE MARKETING APPEAL



1 2 3 4

5

★ PROBABLY CRY★O★VAC's most distinctive feature is its unique property of shrinking sharply when moderate heat is applied. This, coupled with the protective quality of the film, solved a tricky problem for Armour and Company.

Veal, to a packer, is a "soft" meat, and, when boned, is usually frozen before marketing. When rolled and tied into roasts, it squeezes out, giving ragged ends. Careful molding before freezing overcomes this uneven appearance and gives better merchandising appeal.

Here's what CRY★O★VAC did to help. The trimmed roast was dropped into a pre-inflated CRY★O★VAC bag (1). The package was then vacuumized (2) to remove the air. An easy roll twisted the neck of the bag (3) which was then heat-sealed (4). The package was then "dunked" in warm water (5) and the bag shrunk into a tight transparent "second skin" that molded the ends of the roast into the rounded firmness needed for display appeal. As a secondary bonus, since air was excluded, the meat after storage still had the bloom and bright color of fresh-killed meat.

Capitalizing on its unique heat-shrinking property, CRY★O★VAC did another double-barreled job in the food industry.

A
Seventh of a series of
CASE HISTORIES
of commercial uses of
CRY★O★VAC

ARMOUR AND COMPANY

CRY★O★VAC*
a product of
DEWEY AND ALMY CHEMICAL COMPANY
CAMBRIDGE 40, MASSACHUSETTS

CRY★O★VAC— Reg. U. S. Pat. Off. A product and a process for the protection of quick-frozen foods.

FORMULAS FOR FOODS

FORMULA NO. 458

Butterscotch—Emergency Formula

Corn sirup	50 lb.
Standardized invert sugar	15 lb.
Edible oil	5 lb.
Unsweetened evaporated milk	20 lb.
Full fat soya flour, finely ground	5 lb.
Standard frappé*	10 lb.
Salt	8 oz.
Butterscotch flavor	to taste
Yellow color	as desired

Directions

Place the corn sirup, standardized invert sugar, edible oil, evaporated milk and soya flour in a kettle and heat, stirring constantly. Continue to stir and cook to a medium firm ball, then add the frappé, salt, flavor and color. Mix thoroughly.

Cast caramels into starch or spread on an oiled slab between bars, leveling to the required height, and cut when cold. Wrap.

*Frappe

This is the frappé made with 50 lb. of corn sirup, 50 lb. of standardized invert sugar, 1 lb. of albumen and 2 lb. of water. The corn sirup is boiled to 245 deg. F., then the heat is turned off and the standardized invert sugar added, and the batch stirred until the sugar is melted. Place in marshmallow beater, add the albumen solution gradually while beating, and beat until light. The frappé may be made days in advance of use and stored in a covered container free from iron or rust.

Formula from The Nulomoline Co.

FORMULA NO. 459

Devil's Food Cake Mix

High-grade cake flour	5 lb.
Cocoa (natural)	1 lb. 8 oz.
Salt	2½ oz.
Baking powder	3 oz.
Soda	1¼ oz.
All-purpose shortening	2 lb. 8 oz.
Fine granulated sugar	7 lb.
Liquid milk	6 lb. 14 oz.
Vanilla	
Whole eggs	2 lb. 12 oz.

Directions

Sift together the cake flour, cocoa, salt and baking powder. Start mixing at low speed. Add the shortening and sugar. Mix until smooth. Add 4 lb. 4 oz. of liquid milk and the vanilla. Milk and shortening should be at 70 to 75 deg. F.

Mix the eggs with the remainder of the milk, and add in 3 portions over a period of 2 minutes, still at low speed. Stop the machine and scrape the bowl well. Continue mixing for 5 minutes at low speed. The total time of mixing should be 5 minutes in the first stage and 7 minutes in the second.

This can be baked at 375 deg. F. as 12-oz. standard loaf cakes, or at 290 to 400 deg. F. for layer or cup cakes. Remove from pans while warm.

Formula from Lever Bros.

FORMULA NO. 460

Orange Blossom Coffee Cake

Cake flour	4 lb. 4 oz.
Salt	¾ oz.
Granulated sugar	1 lb. 12 oz.
Baking powder*	3½ oz.
Shortening	1 lb.
Whole eggs	12 oz.
Orange juice	1 lb. 8 oz.
Orange gratings	1½ oz.
Liquid milk*	2 lb. 8 oz.

* Proportions may be varied somewhat.

Directions

Sift together the flour, salt, sugar and baking powder. Mix in the shortening as for a pie dough, to a coarse, mealy consistency. Mix the eggs, slightly beaten, with the orange juice, orange gratings and milk, and incorporate this liquid into the mix, being sure not to overmix.

Scale into lightly greased tins and cover the top of the cake generously before baking with orange crumb topping. Formula 451. Scale 16 oz. for 9x9x2-in. tins, or 12 oz. for 8-in. round layers.

Bake at 400 to 425 deg. F. for approximately 20 minutes.

Formula from General Mills.

FORMULA NO. 461

Soy-Corn Muffins

Enzyme-converted corn sirup	1 lb. 8 oz.
Whole eggs	12 oz.
Cake flour	1 lb. 8 oz.
Corn meal	2 lb. 8 oz.
Low-fat soya flour	1 lb. 4 oz.
Salt	2 oz.
Baking powder	4 oz.
Salad oil or melted shortening	10 oz.
Water (variable) about	4 lb.

Directions

Place the corn sirup and eggs in a bowl with 2 lb. 4 oz. of water, and stir well together. Sift the dry ingredients together, add to the above mixture, and mix smooth. Add and stir in the salad oil or melted shortening, then the balance of the water. Mix smooth.

Deposit at once into flour-greased muffin tins. Scale 18 to 22 oz. per dozen. Bake at 400 deg. F.

Formula from A. E. Staley Mfg. Co.

FORMULA NO. 462

Peanut Butter Cup Cakes

Butter or margarine	2 lb. 13 oz.
Peanut butter	2 lb. 10 oz.
Sugar	5 lb. 4 oz.
Eggs	2 lb. 8 oz.
Baking powder	6 oz.
Salt	1 oz.
Milk	6 lb. 6 oz.
Vanilla	2 oz.
Sifted soft wheat flour	7 lb. 14 oz.

Directions

Cream the peanut butter and shortening together. Add the sugar, continue to mix, then add the eggs, beaten.

Sift the dry ingredients together. Mix the vanilla with the milk. Add the sifted dry ingredients alternately, mixing on slow speed.

Bake at 350 deg. F. for 20 to 30 minutes, as cup cakes.

Formula adapted from National Peanut Council.

FORMULA NO. 463

Barbecued Pork Loaf

Pork cheeks	60 lb.
Pork giblets	10 lb.
Salt	1 lb. 12 oz.
White pepper	4 oz.
Tomato catsup	21 lb.
Dry milk solids*	10 lb.

* Not over 1.5 percent fat

Directions

Grind the pork through a large plate, preferably 1½ in. Cover the meat with water and cook slowly until tender.

Put the catsup in a kettle and sift in the dry milk solids and seasoning, stirring well. Unless well stirred, small lumps will form, giving the product an undesirable texture.

When the meat is tender, place it in a meat truck. Pour the catsup mixture over the meat and mix well.

Put in parchment-lined pans. Place in the cooler to chill. After chilling, remove from the pans and stuff into cellulose casings.

Formula from American Dry Milk Institute.

How to LOWER Flavor Costs and IMPROVE Flavor Quality of CITRUS FLAVORED PRODUCTS

To accomplish both results at one time, simply switch to M M & R Citrus Flavor Oils.

The prices of M M & R's nine types of Orange Oil, seven types of Lemon and eight types of Lime are consistently low . . . the variety of Oils is broad enough to meet every production and price consideration.

More important than price is the quality of these Citrus Oils. For almost a half century the M M & R label has stood for top quality.

M M & R flavor experts can show you how to use these Citrus Oils to lower your flavoring costs while improving the taste of your orange, lemon or lime confections, bakery products, beverages, etc. Your inquiry will have immediate attention.

MM&R

CITRUS FLAVOR OILS

MAGNUS, MABEE & REYNARD, INC.

SINCE 1895 . . . ONE OF THE WORLD'S GREATEST SUPPLIERS OF ESSENTIAL OILS

16 DESBROSSES STREET, NEW YORK CITY • 221 NORTH LASALLE STREET, CHICAGO

West Coast Representatives—San Francisco: Braun, Knecht, Heimann Co.• Los Angeles: Braun Corp. Seattle, Portland, Spokane: Van Waters & Rogers, Inc. • Canada: Richardson Agencies, Ltd., Toronto